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Walter J. Martin

“THE gratitude of every home in our island, in our Empire, and indeed throughout the world, except in the abodes of the guilty, goes out to the British airmen, who, undaunted by odds, unwearied by their constant challenge and mortal danger, are turning the tide of world war by their prowess and by their devotion. **Never in the field of human conflict was so much owed by so many to so few.**”

(From a speech made by Mr. Winston Churchill.)

“British Air Forces”: The R.A.F. and The Fleet Air Arm, Completely Illustrated and Described

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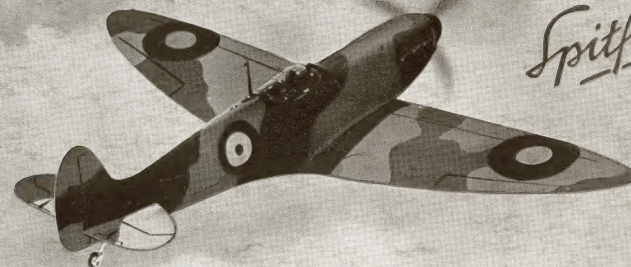
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Spitfire



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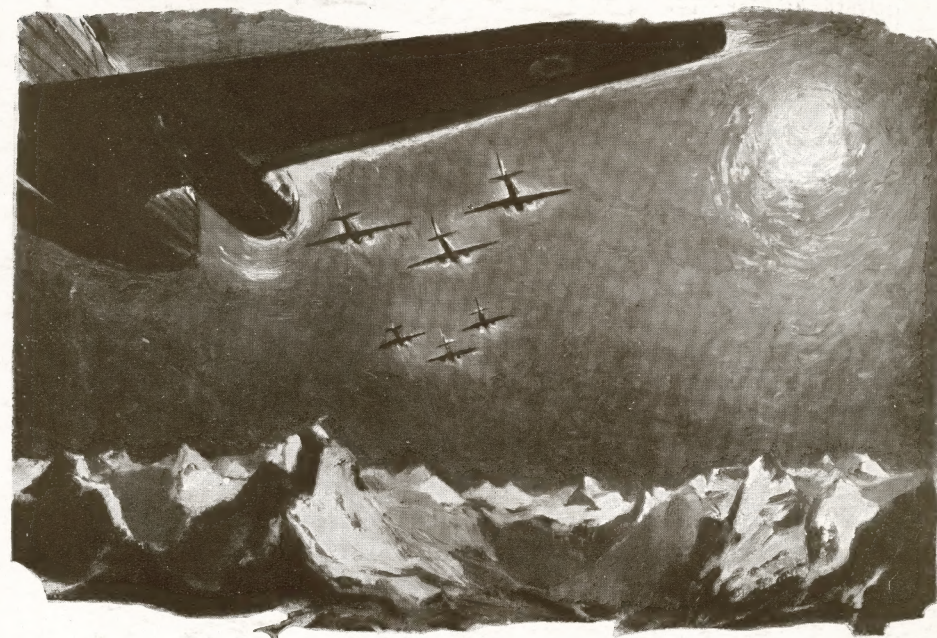
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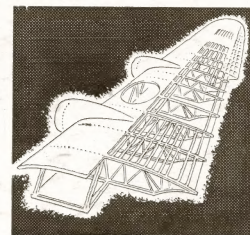
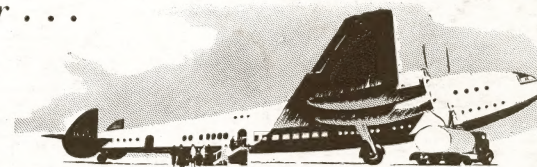
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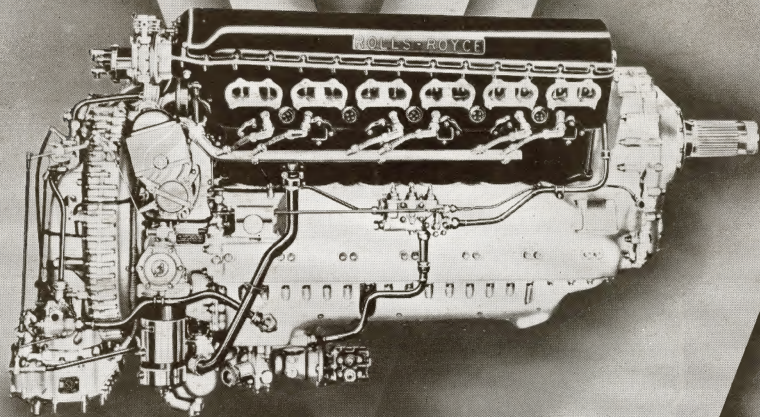


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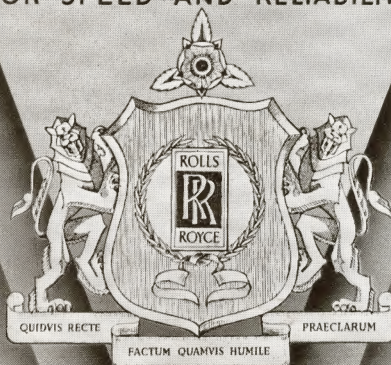
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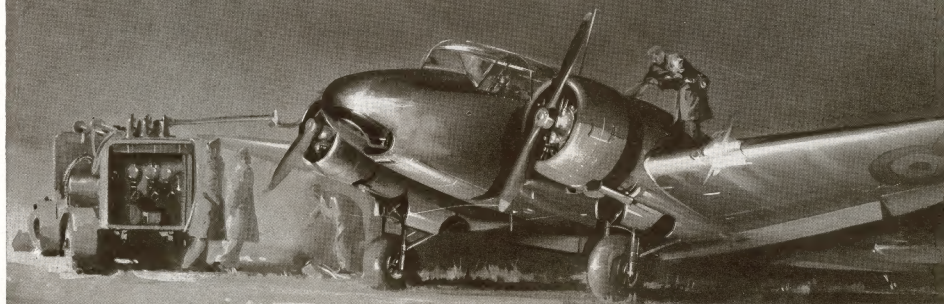
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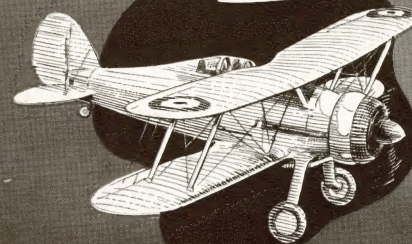


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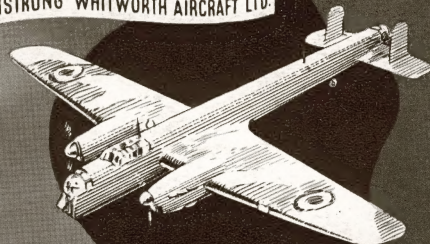
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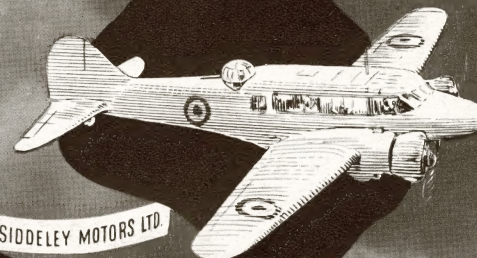
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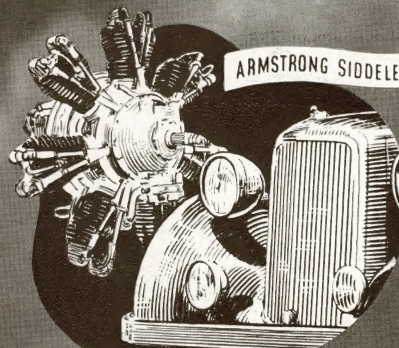
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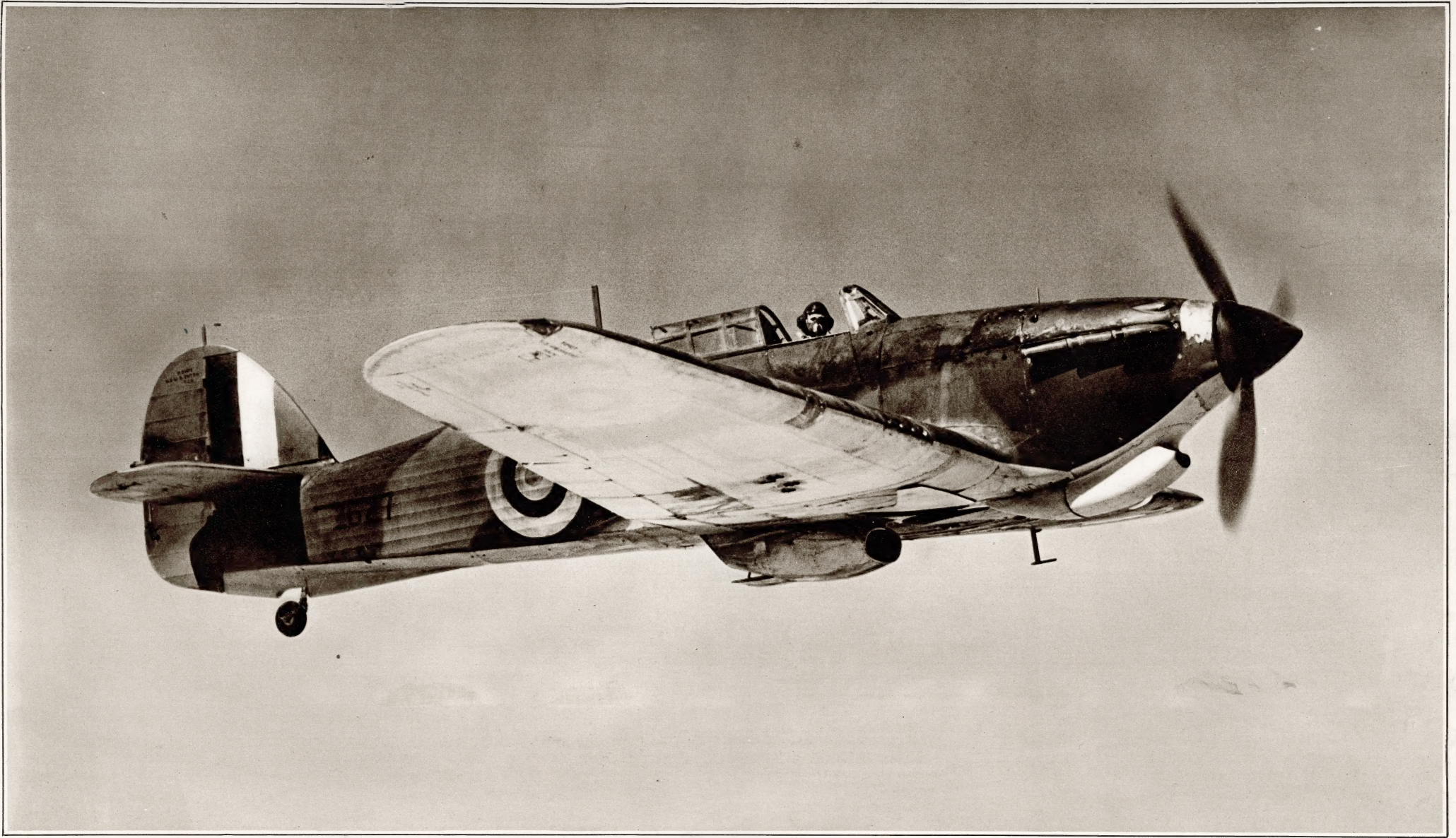


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THE HAWKER "HURRICANE": A CELEBRATED SINGLE-SEATER WHICH HAS BUILT UP AN OUTSTANDING RECORD OF SUCCESS IN MANY THEATRES OF WAR.

DESCRIPTION: Low-wing single-seater monoplane. *Engine:* one 1030-h.p. Rolls-Royce "Merlin." *Wing span:* 40 ft.; *Length:* 31 ft. *Speed (maximum):* 335 m.p.h. *Range:* 730 miles at 213 m.p.h. *Initial climb:* 2400 ft. per minute. *Service ceiling:* 35,000 ft. Single fin and rudder. *Armament:* eight Browning guns mounted in the wings. *Weight (loaded):* 7000 lb. Single-seater fighter aeroplanes are subject to frequent major and minor variations as to engine power, speed, armament, etc., but the above particulars are the latest available for publication at the date when this edition of "British Air Forces" is about to be printed.

HISTORY: The celebrated Hawker "Hurricane" comes from a long line of single-seater and two-seater military aeroplanes, and it was the first monoplane fighter to go into service with the Royal Air Force since 1915, at which time there were a few French monoplane fighters in use in France. Nowadays there can be few, if any, who have not heard of the fame of the "Hurricanes" and the indispensable part played by these machines in August and September 1940. In those grave and dramatic months these machines earned for themselves an indelible place in the history of aerial warfare, and although now and again outpaced by the enemy, their

exceptional manoeuvrability enabled them to outwit and outfight the German pilots—indeed, at the end of fourteen months of war, "Hurricanes" had brought down over fifteen hundred enemy machines of various types. It was in one of these astonishingly efficient aeroplanes that Flight Lieut. J. B. Nicolson earned the first Victoria Cross ever to be awarded to a fighter pilot. With regard to the actual structure of the machine, it is interesting to note that it adheres to-day to the same fundamental principles as those used by the Hawker firm when manufacturing types of aeroplanes in days gone by. As to performance—other than its war

record—a notable achievement was when a "Hurricane" in 1938 flew from Edinburgh to London in 48 minutes at an average speed of 408.75 m.p.h. Since the outbreak of war "Hurricanes" have seen service on many fronts: the Low Countries, France, Norway, Greece and the Middle East. As the first of the eight-gun fighters, the "Hurricane" can be said to have set new standards in fighter performance, admirably lived up to these standards in actual performance and continued the long list of successes achieved by Mr. Sydney Camm, Hawker's Chief Designer.



THE SUPERMARINE "SPITFIRE": A SINGLE-SEATER FIGHTER OF WORLD-WIDE FAME AND A RECORD SECOND TO NONE IN AERIAL COMBAT AGAINST ALL TYPES OF ENEMY MACHINES.

DESCRIPTION: Low-wing single-seater monoplane. *Engine:* one 1030-h.p. Rolls-Royce "Merlin." *Wing span:* 36 ft. 10 in.; *Length:* 29 ft. 11 in. *Speed (maximum):* 387 m.p.h. *Flight duration:* 3-6 hours. *Initial climb:* 2300 ft. per minute. *Service ceiling:* Not disclosed. *Single fin and rudder.* *Armament:* eight Browning machine-guns mounted in the wings. *Loaded weight:* 5850 lb. Single-seater fighter aeroplanes are subject to frequent major and minor variations as to engine power, speed, armament, etc., but the above particulars are the latest available at the date of publication.

HISTORY: With four machine-guns chattering from each wing, the "Spitfire" flew its way into history in August and September 1940 and, against tremendous odds, trounced the invading aeroplanes of the German *Luftwaffe*. A Vickers-Armstrongs product, this world-famous air fighter is descended from the machines, designed by the late R. J. Mitchell and built by the Supermarine Company, which won the Schneider Trophy Contest on four separate occasions—the first time, significantly enough, at Naples in 1922. That race was won at a speed

of 145.7 m.p.h. To-day, "Spitfires" streak across the sky at a speed in the neighbourhood of 400 m.p.h. A feature of the "Spitfire" is the elliptical shape of its wings, but these, while contributing greatly to the aerodynamic efficiency of the craft, proved a big drawback when it came to production in quantity. Great efforts, however, on the part of the manufacturers overcame this handicap and the "Spitfire" became eventually a good production type, without in any way detracting from its remarkable performance in the air. Originally equipped with a two-bladed

fixed-pitch wooden airscrew, the introduction of a three-bladed constant-speed airscrew added considerably to the performance of the machine, especially in rate of climb. Innumerable are the successes of "Spitfire" pilots, but out of hundreds may be mentioned that of Squadron Leader Farquhar, D.F.C., who shot down the first enemy raider on British soil on October 28, 1939. Large numbers of "Spitfires" came into action at Dunkirk, and it was these machines which played a major part on that occasion when nearly 200 German aeroplanes were shot down in one day.



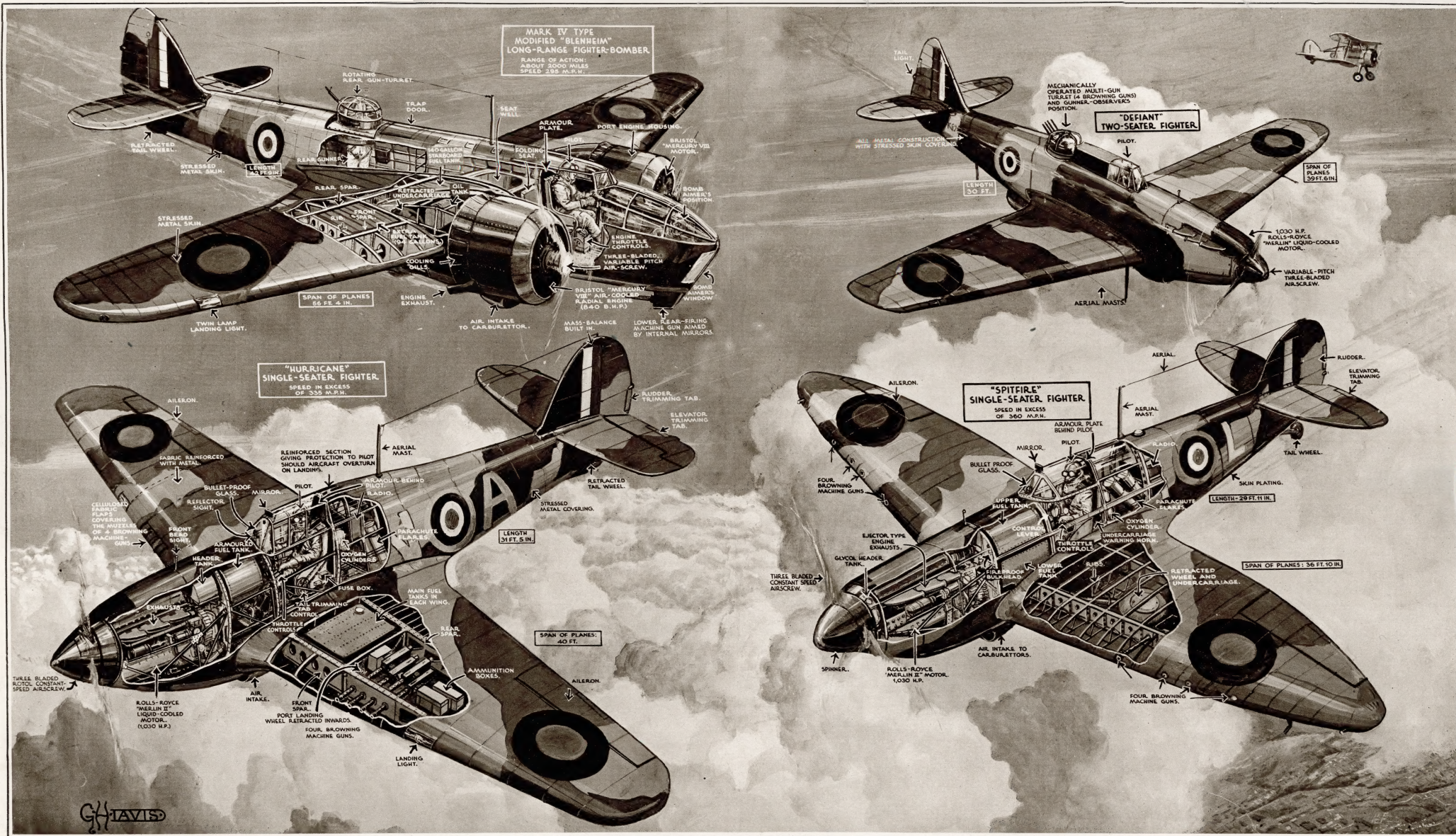
THE BOULTON PAUL "DEFIANT": A TWO-SEATER FIGHTER WHICH BROUGHT NEW TACTICS INTO AIR COMBAT BY DAY AND NIGHT.

DESCRIPTION: Low-wing cantilever monoplane. All-metal structure with stressed-metal covering. *Engine:* one 1030 h.p. Rolls-Royce "Merlin" driving a three-bladed controllable-pitch airscrew. *Wing span:* 39 ft. 6 in.; *Length:* 35 ft. 4 in. *Armament:* four guns mounted in a Boulton Paul electrically-operated turret situated amidships on top of the fuselage. No performance figures have been released, but the top speed may be assumed to be rather less than that of similarly engined single-seater fighters in service. No figures available as to range, service ceiling and initial climb.

HISTORY: The Boulton Paul "Defiant" was originally intended by its designers for use as a night fighter, but its actual début was made in daytime over the beaches of Dunkirk during the evacuation. These fighting two-seaters made a conspicuous start, and on their first day in action twelve of these craft shot down no fewer than thirty-eight enemy aeroplanes without themselves sustaining a single casualty. Thus, at the very beginning, this machine, which was designed before the war, proved beyond doubt the value of two-seater fighter craft. The full success of this type of aeroplane—

mounting four guns in a power-operated gun turret aft of the wings—calls for close co-operation between the pilot and the gunner, and demands fighting tactics entirely different from those of our single-seater fighters. Whereas the latter launch their attacks "head on" the "Defiant" pilot has to manoeuvre his aeroplane so that his gunner can bring his weapons to bear from different angles. These gunners are selected for their ability as marksmen and are specially trained for this type of air fighting; their guns have a fairly wide traverse of fire. Obviously a two-seater fighter

with a large gun turret cannot be expected to equal the speed of a single-seater fighter, but although no official figures have been released, the "Defiant" is known to be extremely nice to fly and light on the controls. Having been used in the early days of the war to deal with special circumstances, the "Defiant" has since reverted to the specialised night fighting for which it was originally intended. Two-seater fighters were used in the last war, but in speed and all-round performance, the "Defiant" bears little, if any, resemblance to those early prototypes.



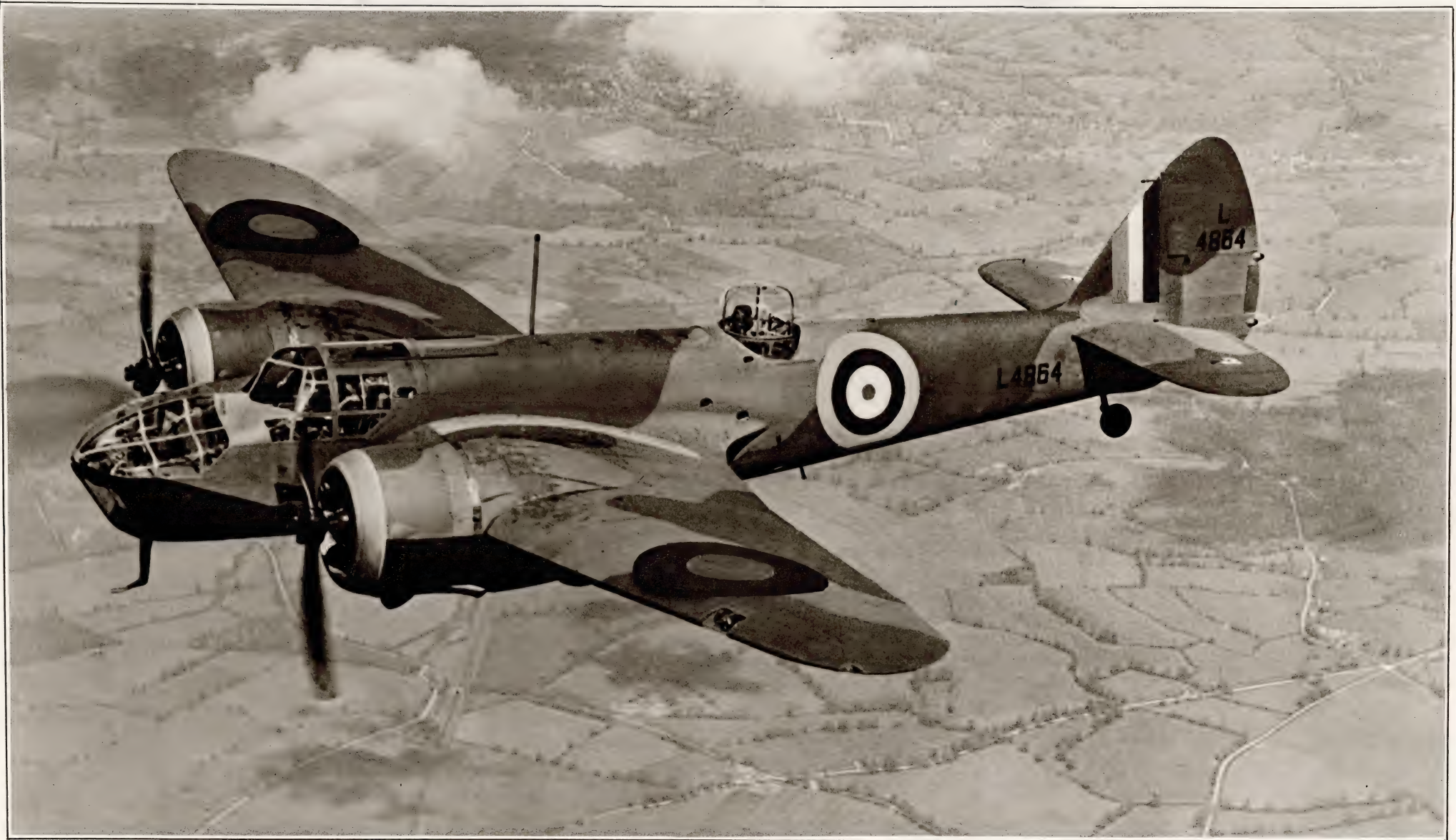
FOUR FAMOUS BRITISH AEROPLANES—"HURRICANE" (FIGHTER), "SPITFIRE" (FIGHTER), "DEFIANT" (NIGHT FIGHTER), "BLENHEIM" (BOMBER-FIGHTER): DIAGRAMS EXPLAINING THE CONSTRUCTION AND OPERATING DETAILS.

In the above drawings are shown in diagrammatic form a famous bombing craft, the "Blenheim," the world-renowned single-seater "Hurricane" and "Spitfire" fighters, and the two-seater night-fighting "Defiant." The similarity in outline of Britain's two most famous fighters is apparent at first glance, but further scrutiny discloses interesting points of difference—for instance, the gun mountings in the wings: grouped close together in fours in the "Hurricane," they are more widely separated in the "Spitfire";

the different form of interior-wing structure will also be noted. In the early stages the design of the "Spitfire," while of high aerodynamic efficiency, made it difficult to produce quickly and in large numbers, but this initial handicap has been overcome. The "Hurricane" has slightly the larger wing-span, but what it loses in sheer speed is amply compensated for by its increased climbing ability and the machine's unusual manoeuvrability. Other pictures of "Hurricane" and "Spitfire" appear on pages 1 and 2.

The introduction of the "Bristol" Blenheim bomber, seen above and on the opposite page, marked a turning-point in British aircraft construction. At the time this notable machine went into service it was faster than any fighter craft then used by the R.A.F. In point of fact, the all-round qualities of the Blenheim are such that these machines have been in service with the Bomber Command, the Coastal Command, and—although to a lesser extent—with the Fighter Command of the R.A.F. On the opposite

page will be found a photograph, details and history of this famous British aeroplane. Another machine of revolutionary design is the Boulton Paul "Defiant" (top; right). A two-seater fighter mounting a battery of guns in a power-operated turret, the "Defiant," although originally intended by its designers for use as a night fighter, has also proved its worth in aerial combat during the daytime. A photograph of the "Defiant" and further details appear on page 3.



THE "BRISTOL" BLENHEIM MARK IV., A FIGHTER-BOMBER-RECONNAISSANCE MONOPLANE OF OUTSTANDING MERIT, WHICH, IN ITS ORIGINAL FORM, REVOLUTIONISED THE BRITISH MILITARY AIRCRAFT POLICY.

DESCRIPTION: All-metal mid-wing cantilever monoplane. *Engines:* Two 920-h.p. "Bristol" Mercury XV. radial air-cooled, with constant speed air-screws. *Wing span:* 56 ft. 4 in.; *Length:* 42 ft. 9 in. *Speed (maximum):* 295 m.p.h. at 15,000 ft.; *Range:* 1900 miles at 220 m.p.h. *Initial Climb:* 1500 ft. per minute. *Service Ceiling:* 27,280 ft. Single fin and rudder. *Armament:* one forward machine-gun, and one gun in power-operated dorsal gun-turret, which is partly retractable. Some models fitted with a forward battery of four machine-guns. *Weight:* 14,400 lb. *Crew:* three.

HISTORY: The series of bombers and bomber-fighter-reconnaissance aircraft known as "Blenheim" Mark I. to IV. was constructed by the "Bristol" Aeroplane Company to a modified design built to the specified requirements of the late Lord Rothermere, by whom the monoplane was subsequently presented to the nation. This revolutionary aeroplane, by its performance under test at Martlesham Heath Air Station, at once upset all the traditional and orthodox conceptions of military aircraft. Thus, the "Bristol" Blenheim had scored its first victory—a victory

which proved it to be faster than any fighter then in service with the R.A.F., and about twice as fast as the fastest bomber. The "Blenheim Mark I.," popularly known as the "short-nose" "Blenheim," began its service in the R.A.F. as a bomber, but, because of its manoeuvrability, was subsequently adapted to fighter duties, and certain Auxiliary Fighter Squadrons were equipped with "Blenheim" fighters. The "Blenheim" "long-nose" Mark IV. was already in production when the war started. These machines carried a heavier load, had a greatly increased range,

more accommodation for the pilot and crew, and a higher fire-power than their predecessors. "Blenheim" bombers took part in the Wilhelmshaven raid on the second day of war. As fighters they raided the German-occupied aerodromes in Norway. Ceaselessly they have attacked German naval ships, harbours, and every kind of ground target in Germany and German-occupied territory. Without exaggeration, it may be said that the original "Bristol" Blenheim marked an important turning-point in Britain's bid for air superiority.



THE HANDLEY-PAGE "HAMPDEN": A BOMBER WITH A LONG AND DISTINGUISHED RECORD OF SUCCESSES OVER SEA AND LAND. SISTER-CRAFT TO THE HANDLEY-PAGE "HEREFORD."

DESCRIPTION: All-metal mid-wing cantilever monoplane. Engines: two 1000-h.p. "Bristol" Pegasus XVIII, radial air-cooled, with controllable pitch or constant speed air-screws. Wing span: 69 ft. 2 in. Length: 53 ft. 7 in. Speed (maximum): 265 m.p.h. at 15,500 ft. Range: 1725 miles at 212 m.p.h. Initial Climb: 980 ft. per minute. Service Ceiling: 22,700 ft. Twin fins and rudders. Armament: six guns mounted in pairs in three positions. Weight: 11,780 lb. Crew: four.

HISTORY: Built as a successor to the "Harrow," the Handley-Page "Hampden"—which was of completely new design—was first produced in June 1938 and was given its name at Radlett Aerodrome by Viscountess Hampden. The ceremony was attended, and watched with considerable interest, by the then German Air Attaché in London and his technical assistant, both of whom accompanied the other guests on a tour of the factory. Unconventional in many ways, the "Hampden," although a mid-wing monoplane, is actually low-wing in relation to the

aft section of the machine. Its very narrow fuselage was designed so as to give the pilot a better field of vision. Another feature of interest is the balcony gun position under the rear part of the fuselage, which places the gunner in an excellent position to deal with any attacks from that direction. For ease of landing, the "Hampden" employs fully-slotted and flapped wings which reduce the landing speed to 73 m.p.h. Modifications of the "Hampden" have been used for dropping sea-mines, and the machine's record as a bomber is distinguished

and varied; included in this is the big raid on Sylt in 1939, during which forty-nine "Hampdens" dropped forty-five tons of bombs. To simplify and accelerate production, the aeroplane is manufactured on the "split-component" system. Large numbers of these machines are being made in Canada. The Handley-Page "Hereford" is a sister-craft to the well-known "Hampden," and first flew in 1939. The "Hereford" resembles the "Hampden" in almost all its features, but is equipped with two Napier "Dagger VIII" engines, each developing 1000 h.p.



THE HANDLEY-PAGE "HAMPDEN" IN ACTION: A VITAL AQUEDUCT OF THE DORTMUND-EMS CANAL BEING BOMBED BY FLIGHT LIEUT. LEAROYD, FOR WHICH DEED HE WAS AWARDED THE V.C.

The war feats performed by the Handley-Page "Hampdens" and their gallant crews are already many and colourful, but it is unlikely that any will surpass that during which Acting Flight Lieut. R. A. B. Learoyd won the Victoria Cross for his valorous attack on the Dortmund-Ems Canal in August 1940. The canal is about 170 miles long and forms a vital transport link between Dortmund—where barges pick up the coal and iron products of the Ruhr—and the great ports of north-west Germany—Bremen and Hamburg. The vital aqueduct

which was the objective of the R.A.F. lies a little to the north of Munster, in Westphalia, where the canal, spanning a deep valley, crosses the upper reaches of the Ems. It crosses the valley practically at right-angles, and the only feasible method of attack was for Lieut. Learoyd to fly his "Hampden" up or down the valley, turn at precisely the right moment into the line of the aqueduct, and then release his bombs within the very brief period during which he was flying (at over 200 miles an hour) over the most vulnerable spot of

the waterway. The first wave of "Hampdens" caught the enemy by surprise; the next was met with terrific anti-aircraft fire, hurled up by guns of all calibres at point-blank range. Despite this, Flight Lieut. Learoyd attacked from a height of 150 ft., and, although he was blinded by searchlights and his aircraft repeatedly hit, successfully achieved his objective. Our drawing bears the signature of Flight Lieut. Learoyd as a token of its authenticity. Another spectacular air action in which many "Hampdens" took part was when the Bomber Command

of the R.A.F. launched a fierce attack in March 1940 on Hornum, the seaplane base at the south end of the island of Sylt. In this operation no fewer than forty-five tons of bombs were dropped by forty-nine "Hampden" bombers which attacked from a low height despite an intensive anti-aircraft barrage. Many decorations have been won by officers and men of the "Hampden" Squadrons, and perhaps the highest tribute one can pay to these justly renowned machines is to say that they have at all times proved themselves worthy of the men who fly them.



THE VICKERS "WELLINGTON MARK III": A BOMBER WITH A HEAVY LOAD-CAPACITY, HIGH POWER OF DEFENCE AND LONG RANGE. "WELLINGTONS" HAVE FORMED THE SPEARHEAD OF BRITAIN'S AERIAL ATTACK.

DESCRIPTION: Mid-wing cantilever monoplane. *Engines:* two 1370-h.p. "Bristol" Hercules two-row radials. *Wing span:* 86 ft. 2 in. *Length:* 64 ft. 7 in. Single fin and rudder. Other details concerning the "Wellington Mark III." have not yet been disclosed. The Vickers "Wellington Mk. IA" is of similar design, but has two 1000-h.p. "Bristol" Pegasus XVIII. engines, a maximum speed of 250 m.p.h. at 15,500 ft., and a range of 2500 miles. Its initial climb is at the rate of 1100 ft. per minute, and service ceiling 24,000 ft.

HISTORY: The original production "Wellington"—designed to carry a bomb-load of two tons—was flown for the first time at Weybridge on December 23, 1937, since when improved "Wellingtons" have appeared from time to time, each one embodying variations in design, engines or equipment. For instance, the second of the series was the "Wellington IA," in which Nash and Thompson hydraulic turrets were fitted in the nose, in the tail and under the mid-points of the fuselage. These turrets mounted two guns each. The "Wellington IC," equipped

with 1000-h.p. "Bristol" Pegasus XVIII. engines, has a top speed of 250 m.p.h. and a range of 3200 miles at 180 m.p.h., and it may be safely assumed that this performance has been still further improved in the "Wellington Mark III," fitted with two 1370-h.p. "Bristol" Hercules engines. "Wellington" aircraft, combining long range, high power of defence and the capacity to carry large bomb-loads, have a war record second to none, and their air fighting ability was proven over a year ago when, in daylight raids over Heligoland, "Wellingtons"

effectively dealt with greatly superior numbers of attacking Messerschmitt "Me 110" fighters. That "Wellington" aircraft are able to take hard knocks as well as give them is largely due to their special geodetic system of metal construction. So well does this form of structure spread the load that, despite large portions being shot away, the machines have been able to reach their bases in safety. The spearhead of our air offensive against Germany, the "Wellington" has been justly described as "the most powerful weapon of offence yet devised."



THE VICKERS "WELLINGTON" TAKING OFF FOR ACTION: AN IMPRESSION OF THE FAMOUS HEAVY BOMBER SETTING OUT AS NIGHT FALLS FOR A LONG-DISTANCE FLIGHT OVER ENEMY OBJECTIVES.

Long range, big bomb-load capacity, high power of defence, speed, and adequate comfort for the crew are the chief needs of the modern bomber. In all these essentials the Vickers-Armstrongs "Wellington" bomber fulfils these requirements probably better than any contemporary aeroplane. Used largely for night bombing, the necessary speed to enable the craft to reach its objective and return home under cover of the darkness is of vital importance, and this the "Wellington" bomber possesses in a high degree. Not only that—this machine, with

its crew of five, is capable of disposing of a formidable bomb-load, and has made the Germans greatly fear the sound of the throbbing crescendo of the "Wellington's" engines as they hover over their ports, bases, oil refineries and munition works. Moreover, against enemy fighters it can render a good account of itself in aerial combat, its armament comprising quick-firing guns not only in the nose and tail, but also amidships in a retractable turret situated under the fuselage. The "Wellington" may be classed with the "Spitfire" and "Hurricane"

as a supremely effective war aeroplane, and yet lots of things might have prevented this superb bomber from ever materialising. Its geodetic construction, as evolved by Mr. B. H. Wallis, was something of a revolution. It needed courage and constant financial aid to back the faith of the inventor in its soundness, and it was this faith on the part of leading men in Vickers, of Sir Robert Maclean, then Chairman of the company, Mr. Rex Pierson, the Chief Designer, and others, that persisted in the experiment during long years of immaturity, since there

was no subsidy to cover the cost of the experimental work. But their faith led them to prepare a production scheme on a large scale, and the nation is indebted to firms like Vickers, who took all the risks over many barren years, and to whom we owe much for our present and ever-growing air supremacy. The "Wellington" test flights in 1936 attracted great attention, and at the last Garden Party of the Royal Aeronautical Society, in 1938, the machine's manoeuvrability (the large bomber looped with ease) created enormous interest.



THE ARMSTRONG-WHITWORTH "WHITLEY IV.": A HEAVY BOMBER WHICH HAS BEEN EXTENSIVELY USED ON LONG-DISTANCE BOMBING AND LEAFLET RAIDS OVER GERMANY, ITALY, NORWAY AND POLAND.

DESCRIPTION: All-metal mid-wing cantilever monoplane. *Engines:* Two 1030-h.p. Rolls-Royce "Merlins," liquid cooled, with controllable-pitch or constant-speed airscrews. *Wing span:* 84 ft.; *Length:* 69 ft. 3 in. *Speed (maximum):* 245 m.p.h. at 17,500 ft. *Range:* 1250 miles at 180 m.p.h. *Initial climb:* 1000 ft. per minute. *Service ceiling:* 25,000 ft. *Twin fins and rudders.* *Armament:* guns in nose and tail mounted in power-operated turrets. *Weight (loaded):* 25,500 lb. *Crew:* Five, constituted normally by two pilots, a navigator and bomb-aimer, radio operator and air-gunner.

HISTORY: Made by Armstrong-Whitworth Aircraft, Ltd., the "Whitley" has been powered both by air-cooled radial engines and liquid-cooled V-types; recent machines being fitted with Rolls-Royce "Merlins." Apart from engine changes, there has been little difference in the various "Whitley" types. This heavy bomber was in production some time before the beginning of the war and was in the vanguard of those machines employed by the Bomber Command in the early days, launching attacks over Germany at the time when Holland and Belgium were being invaded. Primarily

used as a night bomber (owing to its relatively low speed), the "Whitley" has done magnificent work, and its record includes long-distance raids deep into Germany, over Norway and Italy, and these craft have also dropped thousands of leaflets over Polish territory; in fact, "Whitleys" carried out most of the night reconnaissance and leaflet raids soon after the outbreak of hostilities. If somewhat unprepossessing in appearance, this heavy machine does give an impression of stolidity and efficiency, and among some of its unusual features mention must be made of the special

box spar wing construction which makes for great strength and high power of resistance when flying with heavy loads in the worst kind of weather. The ability of wings so constructed to take heavy punishment was amply demonstrated in a certain authenticated case of a "Whitley" which was so badly damaged by an electrical storm that most of the covering of one wing was torn off. Despite this, the pilot brought the machine safely back to its base. The "Whitley" takes a bomb load of approximately 3500 lb.



THE ARMSTRONG-WHITWORTH "WHITLEY IV." PREPARING FOR ACTION: GROUND STAFF "BOMBING UP" AT THE HOME STATION PRIOR TO OPERATIONS OVER ENEMY TERRITORY.

The Armstrong-Whitworth "Whitley" bomber was mentioned by Sir Archibald Sinclair, the Minister for Air, when, speaking in the House of Commons on March 11, 1941, the Minister included it amongst those machines which "have in the past constituted the R.A.F.'s main offensive armament. The latest models of these," he added, "are fitted with more powerful engines, which give them increased performance and striking power." Well may the highest air officials pay tribute to this notable aeroplane, which possesses a long and distinguished record of success. Only in rare cases does an

aeroplane take on a second lease of life in time of war; yet that happened to the "Whitley." The craft had been in service for some time before the war and figured as one of the current R.A.F. service craft seen at the last R.A.F. display in the summer of 1937. For over a year after the beginning of the war the "Whitley" was the only bomber classified as "heavy" in the R.A.F., by which is meant not that it could carry a heavier load than other machines, but that it could carry heavier calibre bombs. If something of an "ugly sister" in looks, in performance it has fulfilled every task

demand of it—and more. Extensively employed in long-distance night raiding, many are the devastating blows which these craft have struck at the enemy. Over Germany, Italy, Norway, Poland and Occupied France the "Whitleys" have flown, sometimes dropping leaflets, but usually disposing of formidable bomb-loads. And they have proved their ability to take hard knocks as well as give them. During a night raid on the German battle-cruiser "Scharnhorst"—then lying in the Kiel Canal—a "Whitley" had a tail plane shot off, a hole two feet square knocked through the main

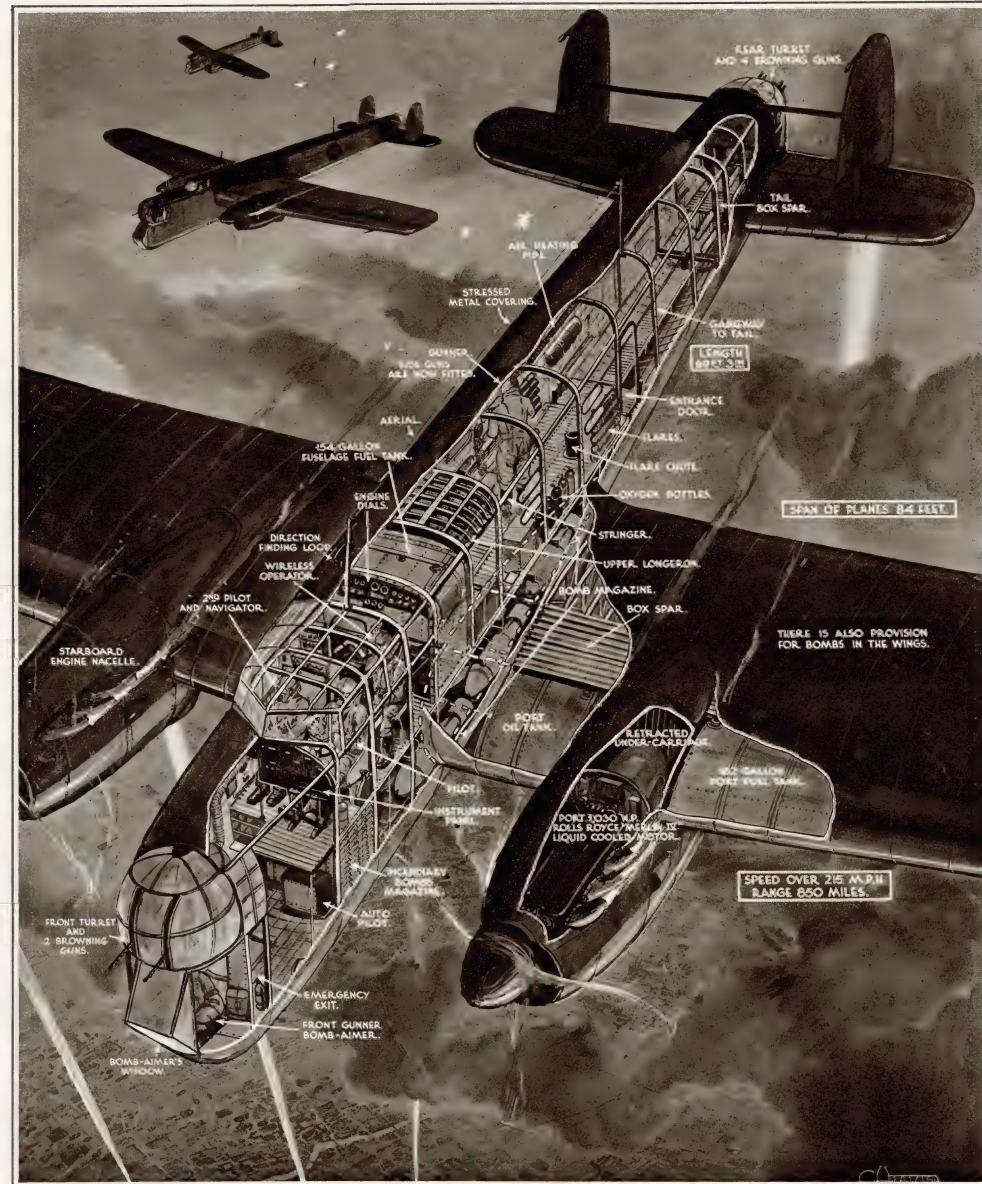
spar of the tail unit, while another shell tore a foot-wide gap in the fuselage. Yet, despite the fact that the rear gunner "expected the tail turret to fall off," it held together and the machine limped safely home. Our drawing shows a "Whitley" at her home station "bombing up." The formidable load of the bomb train provides its own evidence of the aeroplane's striking power. The craft is well equipped for grappling with another enemy—ice, the leading edges of the main wing, tail plane and fin being fitted with de-icers.



INSIDE A "WELLINGTON": A DIAGRAMMATIC PICTURE OF AN AEROPLANE EQUALLY FAMOUS IN ATTACK AND DEFENCE.

In the above diagrammatic drawing something is shown of the geodetic system of construction for which the Vickers-Armstrongs "Wellington" is famous. The curious trellis-like interior of the fuselage is carried out throughout the machine. The geodetic system has been described as a system of metal "construction whereby all the stresses in the structure are taken around the form of the stressed body along the shortest possible external lines." Introduced with the "Wellington," this system has amply proved its worth. From a purely military point of view,

the fact that aircraft built on this method have been so damaged as to appear in danger of immediate collapse and yet have been able to return to their bases speaks for itself. Then again, the apparent intricacy of geodetic construction has proved itself in practice to simplify repair work, since—construction being the same in wings and fuselage—standard methods of repair can be applied throughout the machine. Our picture shows the layout of the machine, the places for the crew, gun positions, and the situation of the bomb-load.



INSIDE A "WHITLEY": ILLUSTRATING THE "ROOMY" ACCOMMODATION OF THIS LONG-RANGE BOMBER.

The Armstrong-Whitworth "Whitley" bomber, of which the above is a diagrammatic drawing, is a good illustration of the adage that "appearances are deceptive," for—despite its seemingly crude shape—the "Whitley" has demonstrated its efficiency on innumerable occasions. The earlier models were equipped with air-cooled radial engines, but the latest "Whitleys" are equipped, as our drawing shows, with liquid-cooled Rolls-Royce "Merlins." In flight the machine has a peculiar "tail-up" appearance, and if the long and narrow fuselage is

far from "pretty," it can carry a crew of five or six in comfort and a heavy load of bombs. The "Whitley" has an excellent "take-off" with a full load, while its very low landing speed makes it ideal for night operations. For it is at night that these craft have done their deadliest work. A notable difference between this Armstrong-Whitworth production and the standard German bombers is in the "roomy" accommodation for the crew, which is almost luxurious by comparison with the cramped interior space of the Junkers "86."



THE LOCKHEED "HUDSON" (R.A.F. COASTAL COMMAND): A GENERAL RECONNAISSANCE BOMBER OF PROVED UTILITY.

DESCRIPTION: Mid-wing cantilever monoplane. All-metal structure with stressed-skin covering. *Engines:* Two 1100-h.p. Wright "Cyclone" radial. *Wing Span:* 65 ft. 6 in. *Length:* 42 ft. 9 in. *Speed (maximum):* 246 m.p.h. at 12,000 ft. *Range:* 1700 miles at 170 m.p.h. *Initial Climb:* 1450 ft. per minute. *Service Ceiling:* 22,000 ft. *Twin fins and twin rudders.* *Armament:* Power-operated gun turret on top of fuselage; two forward-firing guns in the nose. *Weight:* 17,500 lb. *Crew:* Four—pilot, navigator, gunner and wireless operator.

HISTORY: Developed from the Lockheed 14, Super Electra air-transport, the Lockheed "Hudson" General Reconnaissance Bomber is manufactured by the Lockheed Aircraft Corporation, Burbank, California, and deliveries of this craft first began early in 1939. "Hudsons" were, in fact, in the vanguard of the vast supplies of aircraft now being sent to this country. In extensive use with the Coastal Command, these aeroplanes, in addition to ordinary reconnaissance work, have been used in attacking U-Boats and on bombing expeditions in Norway and against the invasion ports.



THE "BRISTOL" BEAUFORT (R.A.F. COASTAL COMMAND): THE FASTEST ALL-PURPOSE MEDIUM BOMBER IN THE WORLD.

DESCRIPTION: Mid-wing cantilever monoplane with single fin and rudder. *Engines:* Two 1065-h.p. "Bristol" Taurus, radial air-cooled, with controllable-pitch airscrews. *Wing Span:* 57 ft. 10 in. *Length:* 44 ft. 2 in. *Speed:* Known to be over 300 m.p.h., but this and other details of performance are not yet disclosed. *Single fin and rudder.* *Armament:* Power-operated turret on top of fuselage, and forward machine-guns. *Weight:* No information available. *Crew:* Four, consisting normally of a pilot, gunner, navigator and radio operator.

HISTORY: Designed for rapid production and sub-divisional construction, the "Beaufort" is claimed to be the fastest medium-bomber in the world, and can be employed both as a bomber and torpedo-carrier; the enclosed bay for carrying a torpedo can also be used for storing mines when the aircraft is engaged in mine-laying. The "Beaufort" came into service shortly before the War, and although outwardly not unlike the "Blenheim," it is, in fact, of entirely new design. "Beauforts" are being produced in large numbers in Australia.



INSIDE A "SUNDERLAND" FLYING-BOAT: AIR-GUNNERS IN THE PORT AND STARBOARD GUN HATCHES, WHICH ARE SITUATED ON THE TOP OF THE HULL AND JUST AFT OF THE WINGS. IN THE CENTRE IS THE WALKWAY.



A SERGEANT NAVIGATOR PLOTTING THE CRAFT'S COURSE. THE PICTURE IS REMINISCENT OF A SHIP'S CABIN AND CONVEYS THE AMPLE INTERIOR SPACE OF THE "SUNDERLAND." A CREW OF SIX IS USUALLY CARRIED.



THE GREAT SIZE OF THE "SUNDERLAND" IS APPARENT IN THIS PICTURE. NOTE THE FOUR HOODED GUNS IN THE REAR TURRET.

THE "SUNDERLAND."

DETAILS OF BRITAIN'S GIANT SHIP OF THE AIR.

THE Short "Sunderland" General Reconnaissance Flying-boat is one of the largest in existence and is actually a military version of the famous Empire flying-boats. The deep hull is double-decked and has spacious accommodation with a galley and mess rooms. The construction of this mighty craft is all metal with stressed skin, its engines develop over 4,000 h.p., and its loaded weight is no less than 50,100 lb. Some idea of the storage capacity of the craft may be gained from the fact that while its normal flying range is 1780 miles, it has a maximum overload range of 2900 miles—which means carrying 128 gallons of oil and no fewer than 2034 gallons of petrol. The wing area of the "Sunderland" is 1467 sq. ft.



THE PILOT AND AN OBSERVER AT THEIR PLACES IN THE DUAL-CONTROL CABIN OF A "SUNDERLAND" DURING A RECONNAISSANCE FLIGHT. THESE CRAFT ARE SOMETIMES ON PATROL FOR TEN TO FOURTEEN HOURS AT A STRETCH.



BELOW THE PILOT'S "OFFICE," AND RIGHT IN THE NOSE OF THE AIRCRAFT, THE BOMB-AIMER ADJUSTS HIS SIGHTS. THE SOLID CONSTRUCTION OF THE FLYING-BOAT IS CLEARLY SHOWN IN THIS PICTURE.



THE SHORT "SUNDERLAND": A FAMOUS FOUR-ENGINE FLYING-BOAT OF HUGE SIZE, WITH A LONG RANGE, AND EXTENSIVELY EMPLOYED BY THE R.A.F. COASTAL COMMAND ON CONVOY AND RECONNAISSANCE WORK.

DESCRIPTION: High-wing cantilever monoplane. Engines: four 1010-h.p. "Bristol" Pegasus radial air-cooled, with three-bladed constant speed air-screws. Wing span: 112 ft. 10 in.; Length: 85 ft. 4 in. Speed (maximum): 210 m.p.h. at 6250 ft. Range: 2880 miles at 178 m.p.h. Initial Climb: 1200 ft. per minute. Service Ceiling: 20,500 ft. Single fin and rudder. Armament: two gun turrets, in nose and tail. Two gun positions amidships. Weight: 50,100 lb. Crew: six.

HISTORY: The name of Short has been well known in the world of flying for many years, the three brothers Short (one of whom survives) having started their aeronautical career as manufacturers of balloons. The Short Sunderland of to-day is a direct descendant of the original designs which the Short brothers produced after building the early Wright biplanes. In view of the work done by the Sunderland to-day for the Coastal Command, it is interesting to recall that in the last war the Short "Two-two-five" seaplane was extensively used by

the Royal Naval Air Service, and was one of the first seaplanes employed for dropping torpedoes. The present-day Sunderland was preceded by such famous machines as the "Calcutta," "Rangoon," "Singapore," and the Empire flying-boats. One of the biggest craft in service with the R.A.F., it has been more especially used by the Coastal Command in connection with reconnaissance, and, far out over the Atlantic, has done invaluable work in convoying ships and as a submarine patrol craft. Over the North Sea as well it has steadily added

laurels to its reputation. Sunderlands played their part in the Norwegian campaign, and have on many occasions proved their worth in rescue work. A case in point was when a Sunderland saved thirty-four members of the steamer *Kensington Court*, for which feat Flight Lieuts. Smith and Barrett were awarded the D.F.C. Powerfully armed, the Sunderland has already shown its capabilities in dealing with enemy craft. Aircraft of this type are often on patrol for twelve or more hours at a time from dawn till dusk.



THE AVRO "ANSON" (R.A.F. COASTAL COMMAND): A MONOPLANE OF PROVED WORTH ON CONVOY DUTY, AND AS A TRAINER.

DESCRIPTION: Low-wing cantilever monoplane. *Engines:* Two 350-h.p. Armstrong Siddeley "Cheetah." *Wing Span:* 56 ft. 6 in. *Length:* 42 ft. 3 in. *Speed (maximum):* 188 m.p.h. at 7000 ft. *Range:* 790 miles at 158 m.p.h. *Initial Climb:* 720 ft. per minute. *Service Ceiling:* 19,000 ft. *Armament:* Machine-guns in nose and turret mounted on top of fuselage. *Weight:* 5375 lb. *Crew:* Three. Much used as a training craft.

HISTORY: The "Anson" at the outbreak of the war was in use as a training machine, but, adapted for use with the Coastal Command, and rearmed, was soon in action with the enemy. Avro "Ansons" have played and are playing an important part in the defence of shipping. Operating above the North Sea, these machines have proved themselves capable of beating off enemy fighters.



THE SARO "LERWICK" (R.A.F. COASTAL COMMAND): ONE OF THE FASTEST AND MOST HEAVILY ARMED FLYING-BOATS.

DESCRIPTION: High-wing cantilever monoplane flying-boat. *Engines:* Two 1375-h.p. "Bristol" Hercules radial air-cooled, driving three-bladed constant-speed airscrews. *Wing Span:* 81 ft. 0 in. *Length:* 63 ft. 0 in. *Single fin and rudder. Armament:* Three power-operated gun turrets. No details of structure, weights and performance have been released. The three gun positions are situated in the nose, tail and amidships.

HISTORY: One of the latest and most formidable additions to Britain's air might, the "Lerwick," made by Saunders-Roe, Ltd., is one of the fastest flying-boats in the world. The spacious cabin accommodation of the machine allows ample room for a crew of six, though the number carried would vary with the nature of the operation in hand. A distinctive feature of the "Lerwick" is the unusual depth of its hull.



SARO "LONDON" (R.A.F. COASTAL COMMAND): VETERAN FLYING-BOATS, USED FOR RECONNAISSANCE AND TRAINING, ON PATROL.

DESCRIPTION: Unequal span biplane flying-boat. *Engines:* Two 1000-h.p. "Bristol" Pegasus radial air-cooled. *Wing Span:* 80 ft. *Length:* 56 ft. 6 in. *Speed (maximum):* 155 m.p.h. *Range:* 1740 miles at 132 m.p.h. *Initial Climb:* 1180 ft. per minute. *Service Ceiling:* 19,900 ft. *Twin fins and rudders. Armament:* Gun positions in the nose and on top of the fuselage behind the wings and aft of the rudders. *Weight:* 11,100 lb. *Crew:* Six.

HISTORY: The Saro "London" was a forerunner of the "Lerwick" and, although a veteran among flying-boats, is still doing good work as a training machine. For many years the "London" did yeoman service with the Coastal Command on reconnaissance duties. At the outbreak of hostilities these machines were due for replacement, but actually were used on active service—pending the production of the first "Lerwicks."



THE SUPERMARINE "STRANRAER" (R.A.F. COASTAL COMMAND): ONE OF THE FIRST MACHINES USED FOR CONVOY DUTIES.

DESCRIPTION: Braced biplane flying-boat. *Engines:* Two 1000-h.p. "Bristol" Pegasus radial air-cooled. *Wing Span:* 85 ft. *Length:* 54 ft. 10 in. *Speed (maximum):* 165 m.p.h. *Range:* 1000 miles at 105 m.p.h. *Initial Climb:* 1350 ft. per minute. *Service Ceiling:* 18,500 ft. *Twin fins and rudders. Armament:* Three guns: in the nose, amidships and aft, on movable mountings. Bombing and gunnery station in the bow. *Crew:* Six.

HISTORY: The Supermarine "Stranraer" general reconnaissance flying-boat is a product of the famous Vickers-Armstrongs Supermarine Works. At the outbreak of the war a number of "Stranraers" were in use and were extensively employed in aiding the more modern "Sunderlands" in anti-submarine and convoy escort duties. For ease of recognition it should be noted that the rounded biplane wings are of almost equal span.



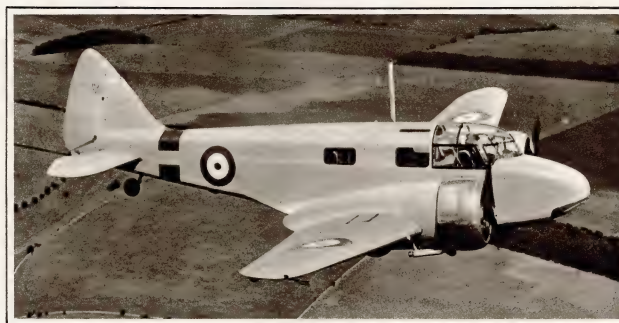
THE FAIREY "BATTLE": A LOW-WING MONOPLANE FOR TRAINING PURPOSES.

DESCRIPTION: First flew 1936. A low-wing all-metal cantilever monoplane, with crew of two. *Engine:* one 1030-h.p. Rolls-Royce "Merlin II." *Wing span:* 54 ft.; *Length:* 42 ft. 2 in. *Maximum speed:* 242 m.p.h. at 17,500 ft. *Range:* 640 miles at 250 m.p.h. *Initial climb:* 5000 ft. in 4 min. 6 sec. *Service ceiling:* 25,000 ft. Single fin and rudder. A modification of the "Battle" bomber for advanced training.



THE NORTH AMERICAN "HARVARD I": AN ADVANCED TRAINER FROM THE U.S.A.

DESCRIPTION: First flew 1938. A low-wing cantilever monoplane. Crew of two. *Engine:* one 600-h.p. Pratt and Whitney "Wasp R." *Wing span:* 43 ft.; *Length:* 27 ft. 6 in. *Maximum speed:* 206 m.p.h. *Range:* 720 miles at 180 m.p.h. *Service ceiling:* 17,400 ft. Single fin and rudder. This American machine is used in large numbers for advanced training. Has a retractable undercarriage.



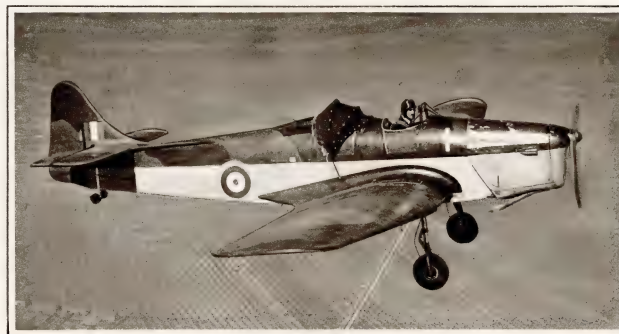
THE AIRSPEED "OXFORD": A LOW-WING CANTILEVER MONOPLANE ADVANCED TRAINER.

DESCRIPTION: First flew 1937. A low-wing cantilever monoplane, with crew of four, for advanced training in R.A.F. *Engines:* two 375-h.p. Armstrong-Siddeley "Cheetah X." *Wing span:* 53 ft. 4 in.; *Length:* 34 ft. 6 in. *Maximum speed:* 197 m.p.h. at 8300 ft. *Range:* 960 miles at 166 m.p.h. *Initial climb:* 1225 ft. per minute. *Service ceiling:* 23,000 ft. Single fin and rudder.



THE DE HAVILLAND "TIGER MOTH": A BIPLANE FOR PRIMARY TRAINING.

DESCRIPTION: First flew 1931. An equal-span staggered braced biplane. Crew of two. *Engine:* one 130-h.p. de Havilland "Gipsy Major I." *Wing span:* 29 ft. 4 in.; *Length:* 23 ft. 11 in. *Maximum speed:* 109 m.p.h. at 1000 ft. *Range:* 300 miles at 93 m.p.h. *Initial climb:* 673 ft. per minute. *Service ceiling:* 13,600 ft. Single fin and rudder. Used for elementary training at home and overseas.



THE MILES "MAGISTER": A PUPIL IS "BLIND FLYING" BELOW THE HOOD.

DESCRIPTION: First flew 1937. A low-wing cantilever monoplane. Crew of two. *Engine:* one 130-h.p. de Havilland "Gipsy Major I." *Wing span:* 33 ft. 10 in.; *Length:* 25 ft. 3 in. *Maximum speed:* 142 m.p.h. at 1000 ft. *Range:* 380 miles at 124 m.p.h. *Initial climb:* 850 ft. per minute. *Service ceiling:* 18,000 ft. Single fin and rudder. In service with the R.A.F. for elementary training at home and abroad.



THE PHILLIPS AND POWIS MILES "MASTER": A MONOPLANE FOR ADVANCED TRAINING.

DESCRIPTION: Low-wing cantilever monoplane. First flew 1937. Crew of two. *Engine:* one 585-h.p. Rolls-Royce "Kestrel XXX." *Wing span:* 39 ft.; *Length:* 30 ft. 3 in. *Maximum speed:* 255 m.p.h. at 15,000 ft. *Range:* 500 miles at 226 m.p.h. *Initial climb:* 1500 ft. per minute. *Service ceiling:* 28,000 ft. Single fin and rudder. This machine is in service with the R.A.F. for advanced training.



THE HAWKER "AUDAX": A SINGLE-BAY STAGGERED BIPLANE FOR TRAINING.

DESCRIPTION: First flew 1932. Unequal-span single-bay staggered biplane. Crew of two. *Engine:* one 535-h.p. Rolls-Royce "Kestrel I.B." *Wing span:* 37 ft. 3 in.; *Length:* 29 ft. 4 in. *Maximum speed:* 170 m.p.h. at 3000 ft. *Range:* 440 miles at 130 m.p.h. *Initial climb:* 1300 ft. per minute. *Service ceiling:* 21,000 ft. Single fin and rudder. Originally in service with R.A.F. as an Army co-operation machine.

TRAINING AIRCRAFT: SOME OF THE TYPES USED FOR THE FLYING EDUCATION OF BRITISH AIRMEN BEFORE THEY ARE POSTED TO ACTIVE SERVICE SQUADRONS.



THE "BRISTOL" BOMBAY (OVERSEAS): A LARGE MONOPLANE USED FOR BOMBING AND FOR TROOP-CARRYING.

DESCRIPTION: High-wing cantilever monoplane. *Engines:* two 1010-h.p. "Bristol" Pegasus XXII.; fully supercharged nine-cylinder radial air-cooled. *Wing span:* 95 ft. 9 in.; *Length:* 69 ft. 3 in. *Speed* (maximum): 192 m.p.h. at 6500 ft. *Range:* 2230 miles at 160 m.p.h. *Initial climb:* 750 ft. per minute. *Service ceiling:* 25,000 ft. *Weight* (loaded): 20,000 lb. *Twin fins and rudder.* *Armament:* gun turrets in nose and tail. *Crew:* four; normally consisting of pilot, navigator, wireless operator and gunner. Accommodation for twenty-four troops.

HISTORY: Although capable of carrying a heavy bomb-load, the "Bristol" Bombay was designed primarily as a troop-carrier, and it is in that capacity that the machine has made a high reputation for itself, especially in the Middle East theatre of war. The Bombay may be said to have won its spurs with the opening of the Greek campaign at the end of 1940. The machine was already being produced by Short and Harland, Ltd., when the war began, although designed by the Bristol Aeroplane Co., Ltd.



THE VICKERS "WELLESLEY" (OVERSEAS): A LONG-DISTANCE RECORD-BREAKER AND PIONEER OF GEODETIC CONSTRUCTION.

DESCRIPTION: Low-wing cantilever monoplane. All-metal geodetic construction with fabric covering. *Engine:* one 1000-h.p. "Bristol" Pegasus XVIII. radial air-cooled, driving a constant-speed airscrew. *Wing span:* 74 ft. 7 in.; *Length:* 39 ft. 3 in. *Speed* (maximum): 216 m.p.h. at 17,000 ft. *Range:* 1880 miles at 160 m.p.h. *Initial climb:* 1200 ft. per minute. *Service ceiling:* 33,000 ft. *Single fin and rudder.* *Armament:* one forward fixed machine-gun and one movable gun in observer's cockpit. *Weight* (loaded): 11,100 lb. *Crew:* three.

HISTORY: Perhaps the most important historical fact concerning the Vickers "Wellesley" bomber is that it was the first fully geodetic aeroplane to go into service with the Royal Air Force. This method of construction has been used with conspicuous success in the famous "Wellington." In November 1938 two "Wellesley" machines with "Bristol" Pegasus engines broke the world long-distance record in a flight from Egypt to Australia, a distance of 7159 miles. Bomb nacelles are shown fitted to the lower "Wellesley" seen in the photograph above.



THE GLOSTER "GLADIATOR" (HOME AND OVERSEAS): A BIPLANE FIGHTER OVER LAND AND SEA.

DESCRIPTION: Single-bay equal-span biplane. Single-seater. *Engine:* one 830-h.p. "Bristol" Mercury radial air-cooled, driving a three-bladed metal airscrew. *Wing span:* 32 ft. 3 in.; *Length:* 27 ft. 5 in. *Speed (maximum):* 250 m.p.h. at 15,500 ft. *Range:* 420 miles at 210 m.p.h. *Initial climb:* 2300 ft. per minute. *Service ceiling:* 33,000 ft. Single fin and rudder. *Armament:* six machine-guns situated in wings and fuselage. Fitted with arrestor-gear and an extra tank, the "Sea Gladiator" is in service with the Fleet Air Arm.

HISTORY: The veteran "Gladiator" has already achieved an enviable war record: it helped to shatter the first raiders to attack Britain in the original large-scale raid over the Firth of Forth in October 1939; was the fighter used by the Finns, and in Finland and Norway was adapted to fly off the ice. The "Gladiator" saw much service in France, and has also taken part in the air war in the Middle East; indeed, many of the 127 Italian aeroplanes brought down in the first three months of the war fell to "Gladiator" pilots.



THE WESTLAND "LYSANDER" (ARMY CO-OPERATION): A MACHINE OF UNUSUAL APPEARANCE—AND ABILITY.

DESCRIPTION: High-wing braced monoplane with fixed undercarriage. *Engine:* one 905-h.p. "Bristol" Perseus radial air-cooled, driving a three-bladed controllable-pitch airscrew. *Wing span:* 50 ft.; *Length:* 30 ft. 6 in. *Speed (maximum):* 230 m.p.h. at 10,000 ft. *Range:* 600 miles at 216 m.p.h. *Initial climb:* 1600 ft. per minute. *Service ceiling:* 26,000 ft. Single fin and rudder. *Armament:* two machine-guns concealed in wheel "spats," a third aft. *Weight:* 6,015 lb. When bombs are carried, they are stored beneath the undercarriage. *Crew:* Two.

HISTORY: Designed for specialised duties, the Westland "Lysander" has done yeoman service in the Royal Air Force, both at home and overseas. Army co-operation was the main idea of the designers; the creation of a machine with a good turn of speed, yet extremely low landing speed. Slotted wings enable the "Lysander" to fulfil both requirements. Carrying complex and extensive equipment, "Lysanders" have done invaluable work in the Middle East, and "Lysander" craft dropped munitions and supplies to the retreating Army at Dunkirk.

Of these aircraft, the following are **FIGHTERS:** *Buffalo, Caribou, Defiant, Gladiator, Hurricane, Lightning, Mustang, Spitfire, Tomahawk, Vanguard.* **BOMBERS:** *Beaufort, Blenheim, Bombay (and troop-carrier), Boston, Botha,*
FLEET AIR ARM: *Albacore, Bermuda, Fulmar, Martlet, Roc, Seafox, Skua, Swordfish, Walrus.* **COMMUNICATIONS:** *Albatross, De Havilland 86B, Dragonfly, Empire, Ensign, Flamingo,*



OF AIRCRAFT TYPES IN USE WITH OUR VARIOUS AIR ARMS.

Cleveland, Douglas DB-8A-5, "Flying Fortress" (Boeing), Hampden, Hereford, Liberator, Maryland, Wellington, Wellesley, Whitley. COASTAL COMMAND: Anson, Catalina, Hudson, Lerwick, London, Singapore, Stranraer, Sunderland. Hendy Heck, Percival Q6, Proctor, Rapide. ARMY CO-OPERATION: Lysander. TRAINERS: Audax, Battle, Cygnet, Harvard, Henley, Magister, Master, Owllet, Oxford, Tiger Moth.



THE PERCIVAL "Q.6" LIGHT TRANSPORT: A LOW-WING MONOPLANE FOR 6-7 PASSENGERS.
DESCRIPTION: A low-wing cantilever monoplane. Carries two pilots and 6-7 passengers. Engines: two 205-h.p. de Havilland "Gipsy Six II," air-cooled, with controllable-pitch airscrews. Wing span: 46 ft. 8 in.; Length: 32 ft. 3 in. Speed (maximum): 195 m.p.h. at 1000 ft. Range: 700 miles at 172 m.p.h. Initial climb: 1150 ft. per minute. Service ceiling: 21,000 ft. Single fin and rudder.



THE SHORT "C"-CLASS "EMPIRE" FLYING-BOAT: A HIGH-WING MONOPLANE MAIL-CARRIER.
DESCRIPTION: First flown 1936. Internal arrangement of the hull provides for two decks, normal accommodation for crew of five, 17 passengers, baggage and two tons of mail. Engines: four 920-h.p. "Bristol" Pegasus Xc, radial air-cooled. Wing span: 114 ft.; Length: 88 ft. Maximum speed: 200 m.p.h. Range: 755 miles at 164 m.p.h. Initial climb: 950 ft. per minute. Ceiling: 17,000 ft. Single fin and rudder.



THE DE HAVILLAND "FLAMINGO": TRANSPORT AND TROOP-CARRYING MONOPLANE.

DESCRIPTION: A high-wing cantilever monoplane, first flew in 1938. Carries a crew of three and can take 18 passengers. Engines: two 930-h.p. "Bristol" Perseus XVI, radial air-cooled sleeve-valved. Wing span: 70 ft.; Length: 51 ft. 10 in. Maximum speed: 239 m.p.h. Range: 1210 miles at 203 m.p.h. Initial climb: 1470 ft. per minute. Service ceiling: 20,900 ft. Twin fins and rudders.



THE PERCIVAL "PROCTOR": A LIGHT TRANSPORT USED FOR COMMUNICATION WORK.

DESCRIPTION: This light, four-seat, low-wing cantilever monoplane is used for military purposes. Engine: one 205-h.p. de Havilland "Gipsy Six II," inverted air-cooled. Wing span: 39 ft. 6 in.; Length: 32 ft. 3 in. Maximum speed: 180 m.p.h. at 1000 ft. Range: 600 miles at 170 m.p.h. Initial climb: 1020 ft. per minute. Service ceiling: 17,000 ft. Single fin and rudder.



THE ARMSTRONG-WHITWORTH "ENSIGN": WITH ACCOMMODATION FOR 40 PASSENGERS.

DESCRIPTION: This high-wing cantilever monoplane carries a crew of five and 40 passengers. All-metal structure with stressed-skin covering. Engines: four 935-h.p. Armstrong-Siddeley "Tiger IX," radial air-cooled. Wing span: 123 ft.; Length: 110 ft. Maximum speed: 205 m.p.h. at 7000 ft. Range: 850 miles at 170 m.p.h. Initial climb: 700 ft. per minute. Service ceiling: 16,500 ft. Single fin and rudder.



THE PHILLIPS AND POWIS MILES "FALCON SIX": A LOW-WING CANTILEVER MONOPLANE.

DESCRIPTION: A low-wing cantilever monoplane. It first flew in 1935, and is a three- or four-cabin machine. Engine: one 200-h.p. de Havilland "Gipsy Six." Wing span: 35 ft.; Length: 25 ft. Maximum speed: 180 m.p.h. at 1000 ft. Range: 880 miles at 160 m.p.h. Initial climb: 1125 ft. per minute. Single fin and rudder. Of wooden structure, with plywood covering on wings and fabric on tail.



THE FAIREY "FULMAR" (FLEET AIR ARM): A 300-M.P.H. FIGHTER MONOPLANE USED IN CO-OPERATION WITH AIRCRAFT-CARRIERS OF THE ROYAL NAVY.

DESCRIPTION: Low-wing cantilever monoplane. All-metal construction with stressed metal covering. *Engine:* one 1145-h.p. Rolls-Royce "Merlin X.", liquid-cooled. *Armament:* eight machine-guns in wings. *Crew:* two. No other details have been released for publication at the date of going to press with this issue, but the top speed of the "Fulmar" is known to be in the neighbourhood of 300 m.p.h.

HISTORY: Despite the fact that information and details concerning this speedy monoplane have not yet been released, the name and the fame of the Fairey "Fulmar" are already known to a large section of the public. The fastest and newest fighter acquired by the Royal Navy, the "Fulmar" is yet another machine from the Fairey works, which has supplied many well-known machines for use with our fighting forces. Actually, the "Fulmar" may be described as a direct descendant of the Fairey "P4/34" of 1936, a machine which was designed for use

as a light bomber. Distinguished predecessors of the "Fulmar" include the Fairey Curtiss-Fox, the "Firefly," the "Fantome," the "Battle," the "Swordfish" and the "Albacore," in the designing of all of which Mr. Marcel Lobelle, then chief designer of the Company, was concerned. In outline and general design, the "Fulmar" bears a strong resemblance to former Fairey practice; the fuselage and nose are especially characteristic, as is the tail design. In service with the Fleet Air Arm—flying from aircraft-carriers—the machine is equipped with arrestor gear

for deck landing; once catapulted into the air it becomes a formidable opponent. It was "Fulmar" machines, taking off from the aircraft-carrier "Illustrious," which escorted the torpedo-dropping "Swordfish" biplanes on the famous Taranto expedition on the night of November 11, 1940. In the Mediterranean theatre of war, "Fulmars" have taken drastic toll of both German and Italian aeroplanes, and include in their "bag" Junkers "Ju 87Bs," Cant "501" flying-boats, Cant "506" seaplanes, and Savoia Marchetti "SM-79" bombers.



THE BLACKBURN "SKUA" (FLEET AIR ARM): THE FIRST FLEET FIGHTER DIVE-BOMBER.

DESCRIPTION: Low-wing cantilever monoplane, with folding wings for stowage in aircraft-carriers. *Engine:* one 905-h.p. "Bristol" Perseus, driving a three-bladed variable-pitch airscrew. *Wing span:* 46 ft. 2 in.; *Length:* 35 ft. 7 in. *Speed (maximum):* 225 m.p.h. at 6,500 ft. *Range:* No details available. *Cruising speed:* 187 m.p.h. at 15,000 ft. *Service ceiling:* 20,200 ft. Single fin and rudder. *Armament:* forward machine-guns mounted in the wings; machine-gun situated in the rear cockpit, on movable mounting. *Weight:* 8,228 lb. *Crew:* two.

HISTORY: Operating against enemy transports and U-boats, the "Skua" has won distinction as a Fleet fighter and dive-bomber. Introduced to the Fleet Air Arm within a year of the outbreak of the war, this machine was not only faster than any previous British aircraft engaged on similar work, and the first monoplane to be used on British aircraft-carriers, but was also the only true dive-bomber in use with our air forces. "Skuas" opened their account with some brilliant work during the Norwegian campaign.



THE BLACKBURN "ROC" (FLEET AIR ARM): A FAST FIGHTER MONOPLANE DEVELOPED FROM THE "SKUA."

DESCRIPTION: Low-wing cantilever monoplane. *Engine:* one 905-h.p. "Bristol" Perseus radial air-cooled, driving a three-bladed constant-speed airscrew. *Wing span:* 46 ft. 2 in.; *Length:* 35 ft. 7 in. Single fin and rudder. *Speed (maximum):* details not released. Other details as to weight and general performance are not released, but are known to be approximately similar to those of the Blackburn "Skua." *Armament:* four machine-guns mounted in an electrically operated Boulton Paul gun turret placed on the top of the fuselage. *Crew:* two.

HISTORY: The "Roc" was designed by the Blackburn Aircraft Company as a development of the "Skua." The two machines are similar in design, but vary considerably on points of detail, and especially in armament. From the point of view of identification, the power-operated gun turret of the "Roc" is easily distinguishable. The "Skua's" wing-tips turn up, those of the "Roc" are level. Both machines have water-tight compartments in the wings and fuselage to give buoyancy in the event of a forced descent on the water.



A BLACKBURN "SKUA" IN ACTION: DIVING FROM 12,000 FT. IN A LOW-LEVEL BOMBING ATTACK ON AN ENEMY WARSHIP. ON THE RIGHT IS ANOTHER "SKUA" CLIMBING AFTER DROPPING A HEAVY BOMB.

With its introduction not long before the outbreak of war, the Blackburn "Skua" represented a considerable advance in the Fleet Air Arm, for it gave them a dive-bomber which was faster than the fastest fighter they had possessed prior to the conversion of the "Gladiator" into a Fleet fighter. The first all-metal, low-wing monoplane to be adopted for use on an aircraft-carrier, the "Skua" has performed admirably off the British shores and in the theatre of war in the Mediterranean, having successfully carried out numerous attack flights

against German and Italian naval units and supply ships, as also against naval targets of importance ashore. The air-brakes, formed by the flaps near the trailing edges of the wings, are used to control the speed in the dive and thereby maintain the correct conditions for dive-bombing attacks. In spite of its high landing speed, the Skua has given good results and lands on the deck of an aircraft-carrier with little more difficulty than former slower types of aircraft. The Skuas first showed publicly what they are capable of doing in April 1940

in a thrilling exhibition, depicted in the illustration above of an attack on Bergen Harbour, showing a Skua dive-bombing on a German warship. Soon after dawn on April 10, 1940, two squadrons of the Fleet Air Arm of Blackburn "Skuas" took off from the Orkneys for Bergen Fjord, nine of the machines leading in the first, closely followed by seven in the second squadron. After the long flight, the coast of Norway was sighted not far north of Bergen, in bright and clear weather, and shortly after a cruiser of the *Köln* class was observed moored

alongside the mole in Bergen Harbour. Manoeuvring to get the sun behind the attackers, the leader gave the signal for action before enemy anti-aircraft was encountered, and in groups of three the Skuas dived down like thunderbolts from about 12,000 ft., each machine in turn releasing its bomb at a low altitude and then zooming up again. Three direct hits were observed on the cruiser and many near misses, explosions and fires being seen by the following squadron. The German cruiser later was reported as sunk.



THE FAIREY "SEAFOX" (FLEET AIR ARM): A CATAPULT SEAPLANE FOR SCOUTING AND SPOTTING DUTIES.

DESCRIPTION: Equal-span two-bay biplane; a light reconnaissance catapult seaplane. *Engine:* One 395-h.p. Napier "Rapier VI." H-type, air-cooled, with constant-pitch airscrew. *Wing Span:* 40 ft. *Length:* 33 ft. 5 in. *Speed (maximum):* 124 m.p.h. at 5800 ft. *Range:* 440 miles at 110 m.p.h. *Initial Climb:* 420 ft. per minute. *Service Ceiling:* 11,000 ft. Single fin and rudder. *Armament:* One machine-gun on a movable mounting. *Weight:* 3805 lb. *Crew:* Two. *Float Gear:* Twin single-step all-metal floats.

HISTORY: First employed by the Royal Navy in 1938, the Fairey "Seafox" was designed to act as a scout and "spotter" for the Fleet, and in this capacity the seaplane has amply proved its worth. It was one of these little "Seafoxes" which contributed largely to the inglorious end of the German battleship *Admiral Graf Spee*. This craft—catapulted from H.M.S. *Ajax*—did invaluable reconnaissance work, and the pilot, Lieutenant Lewin, R.N., was subsequently awarded the D.S.O.



THE VICKERS SUPERMARINE "WALRUS" (FLEET AIR ARM): THE FIRST AMPHIBIAN EMPLOYED BY THE ROYAL NAVY.

DESCRIPTION: Equal-span single-bay amphibian biplane. *Engine:* One 775-h.p. "Bristol" Pegasus air-cooled radial, driving a four-bladed fixed-pitch "pusher" airscrew. *Wing Span:* 45 ft. 10 in. *Length:* 37 ft. 7 in. *Speed (maximum):* 135 m.p.h. at 4750 ft. *Range:* 600 miles at 95 m.p.h. *Initial Climb:* 1050 ft. per minute. *Service Ceiling:* 18,500 ft. Single fin and rudder. *Armament:* Movable machine-gun in the nose and in the cockpit aft of the wings. *Weight:* 4900 lb. *Crew:* Three.

HISTORY: From the same "stable" as the "Spitfire," the Supermarine "Walrus," if not so renowned as the famous fighter, has yet done admirable work in war conditions. In addition to being amphibian, the "Walrus" can be catapulted from warships, and the ability to work from land, sea or ship-board gives it a particularly wide sphere of operation. As the "Seagull" this craft has been extensively employed by the Royal Australian Air Force and was adopted by the Admiralty in 1935.



THE FAIREY "ALBACORE" (FLEET AIR ARM): TORPEDO-SPOTTER-RECONNAISSANCE AIRCRAFT AND DIVE-BOMBER.

DESCRIPTION: Single-bay biplane, with folding wings and interchangeable undercarriage. *Engine:* One 1065-h.p. "Bristol" Taurus radial air-cooled, driving a three-bladed constant-speed airscrew. *Wing Span:* 50 ft. 0 in. *Length:* 39 ft. 10 in. (on floats, the length is 42 ft. 5½ in.) Details as to speed, range, etc., and general performance have not yet been released for publication by the Air Ministry at the time of going to press, but its top speed is known to be in the neighbourhood of 200 m.p.h.

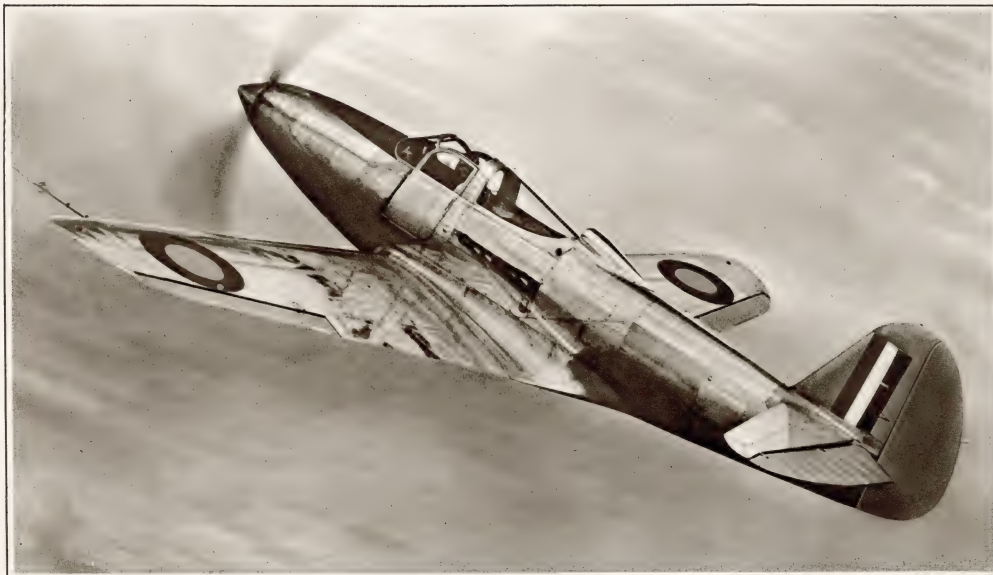
HISTORY: The Fairey "Albacore" was designed as a replacement for the "Swordfish," and has conclusively proved that the unfashionable biplane still has very definite uses in the Fleet Air Arm—largely due to its capabilities in carrying heavy loads for a small wing-span, and the ease with which it can take off from the flying-deck of an aircraft-carrier. Apart from its other duties—similar to those of the "Swordfish"—the "Albacore" has been designed for precision and dive-bombing.



THE FAIREY "SWORDFISH" (FLEET AIR ARM): A TORPEDO-SPOTTER-RECONNAISSANCE AEROPLANE. THE VICTOR OF TARANTO.

DESCRIPTION: Unequal-span staggered braced biplane. *Engine:* One 775-h.p. "Bristol" Pegasus radial air-cooled, driving a three-bladed fixed-pitch airscrew. *Wing Span:* 45 ft. 6 in. *Length:* 36 ft. 4 in. *Speed (maximum):* 154 m.p.h. at 7000 ft. *Range:* 750 miles at 131 m.p.h. *Initial Climb:* 1220 ft. per minute. *Service Ceiling:* 19,250 ft. *Armament:* Fixed gun firing forward, gun on a movable mounting in aft cockpit. *Weight:* 4195 lb. *Crew:* Three for reconnaissance; or two for torpedo-dropping.

HISTORY: The service career of the "Swordfish" began in 1937, when it was put into use as a Torpedo-Spotter-Reconnaissance craft working from an aircraft-carrier. Its undercarriage is interchangeable, wheels or floats being fitted according to the task involved. Although uncouth in appearance, the "Swordfish" possesses certain fundamental qualities which have enabled it to take part in some most important actions. It was "Swordfish" craft which dealt the Italian Fleet a crippling blow at Taranto.



THE "CARIBOU": A FAST SINGLE-SEATER FIGHTER.

DESCRIPTION : A low-wing monoplane single-seater fighter, with single fin and rudder and retractable tricycle undercarriage. *Engine :* One 1150-h.p. Allison. *Wing Span :* 34 ft. *Length :* 29 ft. 9 in. *Speed (maximum) :* 400 m.p.h. at 15,000 ft. *Range :* 965 miles at 335 m.p.h. *Initial Climb :*

3750 ft. per minute. *Service Ceiling :* 35,000 ft. *Armament :* One 37-mm. cannon firing through the airscrew hub, and eight .303 machine-guns, situated in the fuselage and wings. *British Name :* "Caribou." *Maker and Maker's Designation :* Bell P-400, "Aircobra." *U.S.A. Service Designation :* P-39.



THE "BUFFALO": A 330-M.P.H. SINGLE-SEATER FIGHTER.

DESCRIPTION : Mid-wing cantilever monoplane single-seater fighter, with single fin and rudder and retractable undercarriage. *Engine :* One 1200-h.p. Wright Cyclone. *Wing Span :* 35 ft. *Length :* 26 ft. 0½ in. *Speed (maximum) :* 330 m.p.h. at 15,000 ft. *Range :* With extra tanks, 2500 miles.

Initial Climb and Service Ceiling : Figures not available. *Armament :* Six machine-guns, two on engine cowlings, two in each wing. A feature of the "Buffalo" is its short, deep fuselage. *British Name :* "Buffalo." *Maker and Maker's Designation :* Brewster 439. *U.S.A. Service Designation :* F2A-2.



THE "TOMAHAWK" IN FLIGHT—SHOWING THE UNDERCARRIAGE NEATLY RETRACTED.

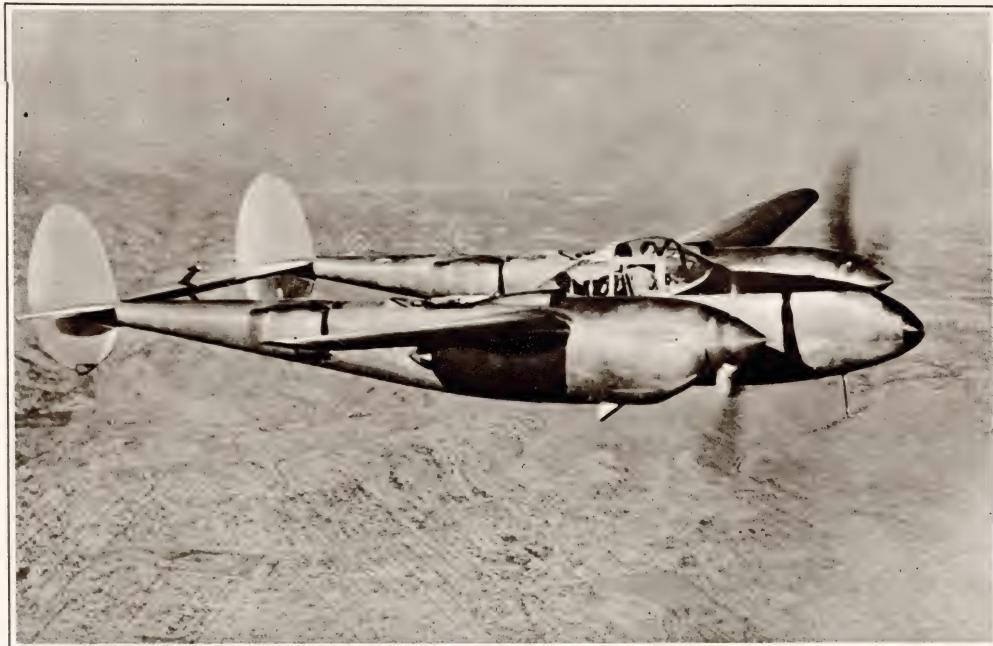


THE "TOMAHAWK": A 327-M.P.H. SINGLE-SEATER FIGHTER.

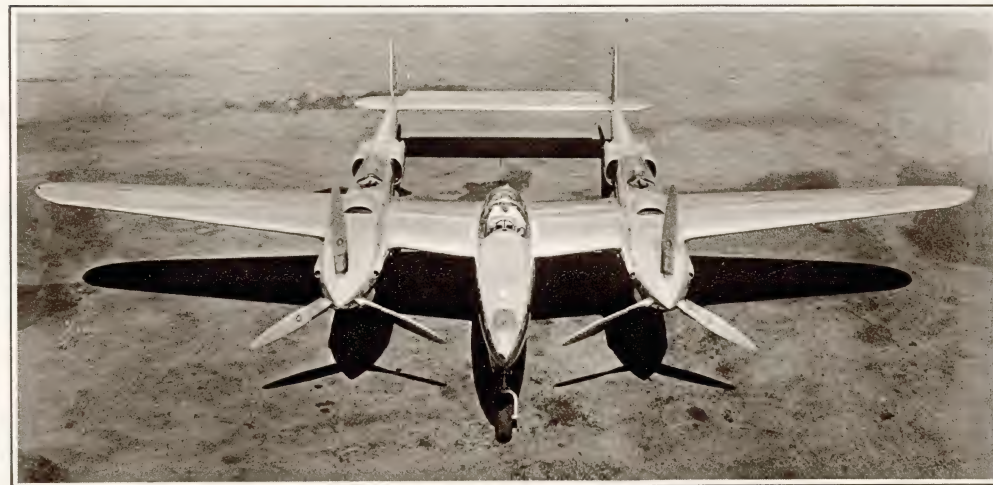
DESCRIPTION : Low-wing monoplane single-seater fighter, with single fin and rudder. The undercarriage turns through ninety degrees to enable the wheels to lie flat in the wings. *Engine :* One 1090-h.p. Allison. *Wing Span :* 37 ft. 3½ in. *Length :* 28 ft. 11 in. *Speed (maximum) :* 327 m.p.h.

at 15,000 ft. Details as to *Range*, *Initial Climb* and *Service Ceiling* not yet available. *Armament :* Six machine-guns, four situated in the wings and two in the fuselage. *British Name :* "Tomahawk." *Maker and Maker's Designation :* Curtiss Hawk 81-A. *U.S.A. Service Designation :* P-40-A.

AMERICAN AIRCRAFT USED BY GREAT BRITAIN.—I: SOME OF THE TYPES CHOSEN FOR THE R.A.F. FIGHTER COMMAND—"CARIBOU," "BUFFALO" AND "TOMAHAWK."



THE "LIGHTNING" SINGLE-SEATER FIGHTER IN PROFILE.



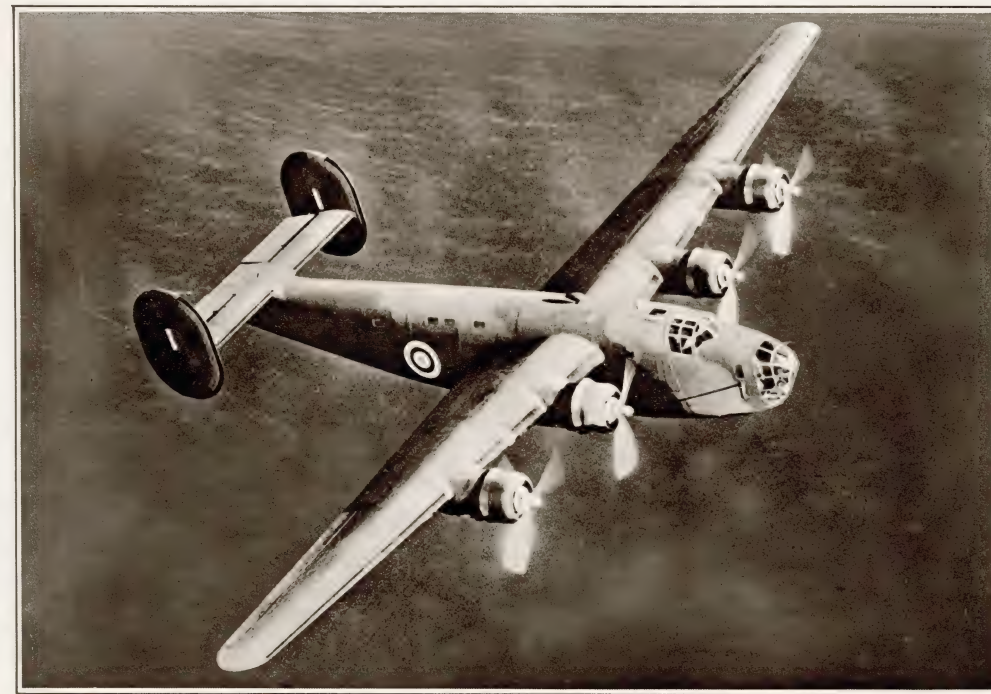
THE "LIGHTNING," SHOWING THE PILOT'S POSITION BETWEEN THE TWO ENGINE NACELLES.

DESCRIPTION : Mid-wing cantilever single-seater fighter monoplane. There is a central nacelle for the pilot, and engines are situated in extensions of twin tail-booms. Twin fins and rudders. Engines : Two 1090-h.p. Allison. Wing span : 52 ft. ; Length : 37 ft. 10 in. Speed (maximum) :

404 m.p.h. at 16,000 ft. Range : 600 miles at 350 m.p.h. Initial climb : 2860 ft. per minute. Service ceiling : 30,000 ft. Armament : Four machine-guns, and one cannon in the nose. British name : "Lightning." Maker and maker's designation : Lockheed 322-61. U.S.A. Service designation : P-38.



THE "LIBERATOR" 335-M.P.H. BOMBER IN FLIGHT.



THE "LIBERATOR" : A LONG-RANGE FOUR-ENGINE AEROPLANE FOR THE BOMBER COMMAND.

DESCRIPTION : High-wing monoplane bomber. Twin fins and rudders. Retractable tricycle undercarriage. Engines : Four 1200-h.p. Pratt and Whitney "Twin Wasp." Wing span : 110 ft. ; Length : 63 ft. Speed (maximum) : 335 m.p.h. at 16,000 ft. Range : 3000 miles at 230 m.p.h.

Initial climb : No figures available. Service ceiling : 36,000 ft. Armament : Gun turrets in nose and tail ; other gun positions in the fuselage. Crew : Six. British name : "Liberator." Maker and maker's designation : Consolidated Model 32. U.S.A. Service designation : B-24.

AMERICAN AIRCRAFT USED BY GREAT BRITAIN—II. : TYPES CHOSEN FOR THE R.A.F. FIGHTER AND BOMBER COMMANDS—"LIGHTNING" AND "LIBERATOR."



THE DOUGLAS "DB-8A-5": A SINGLE-ENGINE ATTACK BOMBER.

DESCRIPTION: Low-wing monoplane of all-metal structure. Single fin and rudder. *Engine:* One 1200-h.p. Wright "Cyclone." *Wing span:* 47 ft. 8 in.; *Length:* 32 ft. *Speed (maximum):* 265 m.p.h. at 9000 ft. *Range:* No figures available. *Initial climb:* To 10,000 ft. in 5.7 min.

Service ceiling: 32,000 ft. *Armament:* Four fixed .30 Colt machine-guns in the wings, and one movable .30-in. gun in rear cockpit. *Crew:* Two. *British name:* Not yet decided. *Maker and maker's designation:* Douglas DB-8A-5. *U.S.A. Service designation:* As yet not released.



THE "MARYLAND": A TWIN-ENGINE 316-M.P.H. BOMBER.

DESCRIPTION: Mid-wing cantilever monoplane of all-metal structure. Single fin and rudder. *Engines:* Two 1050-h.p. Pratt and Whitney "Twin Wasps." *Wing span:* 61 ft. 4 in.; *Length:* 46 ft. 8 in. *Speed (maximum):* 316 m.p.h. at 12,000 ft. *Range:* 1300 miles at 248 m.p.h.

Initial climb: 1790 ft. per minute. *Service ceiling:* 29,500 ft. *Armament:* No details available, but the craft is known to have three gun positions. *Crew:* Three. *British name:* "Maryland." *Maker and maker's designation:* Martin 167-B4. *U.S.A. Service designation:* As yet not released.



THE BOEING "B-299Y": A FOUR-ENGINE 300-M.P.H. BOMBER.

DESCRIPTION: Mid-wing cantilever monoplane bomber. Single fin and rudder. *Engines:* Four 1200-h.p. Wright "Cyclones." *Wing span:* 103 ft. 9 in.; *Length:* 67 ft. 10 in. *Speed (maximum):* 300 m.p.h. at 14,000 ft. *Range:* 2100 miles at 232 m.p.h. *Initial climb:* 1500 ft. per

minute. *Service ceiling:* 29,300 ft. *Armament:* Five gun positions; one in nose, others situated in the fuselage. *Crew:* Seven to nine. *British name:* Popularly known as the "Flying Fortress." *Maker and maker's designation:* Boeing B-299Y. *U.S.A. Service designation:* B-17B.



THE "CATALINA": A TWIN-ENGINE FLYING-BOAT FOR THE COASTAL COMMAND.

DESCRIPTION: High-wing reconnaissance-bomber flying-boat. Single fin and rudder. *Engines:* Two 1200-h.p. Pratt and Whitney "Twin Wasps." *Wing span:* 104 ft.; *Length:* 65 ft. 1 in. *Speed (maximum):* 190 m.p.h. at 10,500 ft. *Range:* 4000 miles at 130 m.p.h. *Initial*

climb: 1100 ft. per minute. *Service ceiling:* 25,200 ft. *Armament:* The gun positions are situated in the nose and on top of the hull just aft of the wings. *Crew:* Six. *British name:* "Catalina." *Maker and maker's designation:* Consolidated Model 28-5. *U.S.A. Service designation:* PBV-5.

AMERICAN AIRCRAFT USED BY GREAT BRITAIN—III.: TYPES CHOSEN FOR THE R.A.F. BOMBER AND COASTAL COMMANDS—DOUGLAS, BOEING, "MARYLAND" AND "CATALINA."



THE "CLEVELAND": A DIVE-BOMBER FOR THE R.A.F. BOMBER COMMAND.

DESCRIPTION: Braced staggered biplane two-seater dive-bomber. Single fin and rudder. *Engine:* One 1000-h.p. Wright "Cyclone." *Wing span:* 34 ft.; *Length:* 27 ft. 7 in. *Speed (maximum):* 240 m.p.h. at 17,000 ft. *Range:* 730 miles at 204 m.p.h. *Initial climb:* No figures available.

Service ceiling: 24,700 ft. *Armament:* One fixed forward machine-gun, and another machine-gun on a movable mounting aft of the main wings. *British name:* "Cleveland." *Maker and maker's designation:* Curtiss "Helldiver-77." *U.S.A. Service designation:* SBC-4.



THE "MARTLET"—FAST AND HIGHLY MANOEUVRABLE.



THE "BOSTON II": AN ATTACK-BOMBER FOR THE R.A.F. BOMBER COMMAND.

DESCRIPTION: High mid-wing monoplane. Single fin and rudder. Retractable tricycle undercarriage. *Engines:* Two 1050-h.p. Pratt and Whitney "Twin Wasps." *Wing span:* 61 ft. 4 in.; *Length:* 47 ft. 7 in. *Speed (maximum):* 325 m.p.h. at 13,000 ft. *Range:* 1200 miles at

280 m.p.h. *Initial climb:* No figures available. *Service ceiling:* 17,000 ft. on one engine. *Armament:* Two or four fixed machine-guns in the nose; two movable guns in rear. *British name:* "Boston II." *Maker and maker's designation:* Douglas DB-7A. *U.S.A. Service designation:* A-20A.



THE "MARTLET": A SINGLE-SEATER FIGHTER FOR THE FLEET AIR ARM.

DESCRIPTION: Low-wing cantilever monoplane. All-metal construction. Single fin and rudder. *Engine:* One 1200-h.p. Wright "Cyclone." *Wing span:* 38 ft.; *Length:* 28 ft. 10 in. *Speed (maximum):* 325 m.p.h. at 13,500 ft. *Range:* 1150 miles at 285 m.p.h. *Initial climb:* 3300 ft. per

minute. *Service ceiling:* 28,000 ft. *Armament:* Two machine-guns in the wings, and two machine-guns firing through the airscrew disc. *British name:* "Martlet." *Maker and maker's designation:* Grumman G-36A. *U.S.A. Service designation:* F4F-3.

AMERICAN AIRCRAFT USED BY GREAT BRITAIN—IV.: SOME OF THE TYPES CHOSEN FOR THE R.A.F. BOMBER COMMAND AND FOR THE FLEET AIR ARM—"CLEVELAND," "BOSTON II." AND "MARTLET."



THE BREDA "65": AN ITALIAN FOUR-GUN FIGHTER WITH A SPEED OF 265 M.P.H.

DESCRIPTION: A low-wing monoplane developed from the Breda "64." This machine is generally used as a single-seater, but a crew of two is carried on occasion. *Engine:* One 1000-h.p. Fiat radial. *Wing span:* 39 ft. 8 in.; *Length:* 31 ft. 6 in. *Maximum speed:* 265 m.p.h. The armament consists of four machine-guns mounted in the wings, firing forward; two Breda 12.7 mm. and two Breda 7.7 mm.



THE MACCHI "C.200": ITALY'S FASTEST FIGHTER, WITH A SPEED OF 313 M.P.H.

The speediest fighter in use with the Regia Aeronautica, the "C.200" is slow in comparison with British fighters. *Engine:* One 840-h.p. Fiat radial. *Wing span:* 34 ft. 8 in.; *Length:* 26 ft. 10 in. *Maximum speed:* 313 m.p.h. *Rate of climb:* 19,680 ft. in 6.5 min. *Absolute ceiling:* 32,000 ft. *Armament:* twin Breda 12.7 mm. machine-guns, mounted above the fuselage, firing through the airscrew.



THE FIAT "C.R. 42": A FIGHTER NOTED MORE FOR MANEUVRABILITY THAN SPEED.

An unequal span biplane, the "C.R. 42" is in the same category as our Gloster "Gladiator." The craft is very maneuverable, but slow as a fighter. *Engine:* One 840-h.p. Fiat radial. *Wing span:* 31 ft. 10 in.; *Length:* 27 ft. 3 in. *Maximum speed:* 272 m.p.h. *Service ceiling:* 32,800 ft. Climbs to 19,680 ft. in eight minutes. *Armament:* two geared machine-guns firing through airscrew.



THE FIAT "B.R. 20": A STANDARD ITALIAN BOMBER IN LARGE-SCALE PRODUCTION.

DESCRIPTION: A low-wing monoplane. *Engines:* Two 1000-h.p. Fiat radials. *Wing span:* 70 ft. 9 in.; *Length:* 52 ft. 9 in. *Maximum speed:* 261 m.p.h. *Range:* 1240 miles at 210 m.p.h. *Ceiling (on one engine):* 13,000 ft. *Armament:* one 12.7 mm. machine-gun in power-operated turret in nose; twin machine-guns in retractable turret on top of fuselage, and one machine-gun beneath.



THE BREDA "88": A MACHINE USED FOR FIGHTING, BOMBING AND RECONNAISSANCE.

DESCRIPTION: A high-wing monoplane, the Breda "88," although an "all-purpose" machine, is actually faster than the single-seater Italian fighters. *Engines:* Two 1000-h.p. Piaggio radial. *Wing span:* 50 ft. 10 in.; *Length:* 37 ft. 9 in. *Maximum speed:* 321 m.p.h. Climbs to 16,400 ft. in 11 min. *Service ceiling:* 27,880 ft. *Armament:* two or more Breda machine-guns in the nose. One or more aft.



THE SAVOIA-MARCHETTI "S.M. 79": A WELL-KNOWN THREE-ENGINE ITALIAN BOMBER.

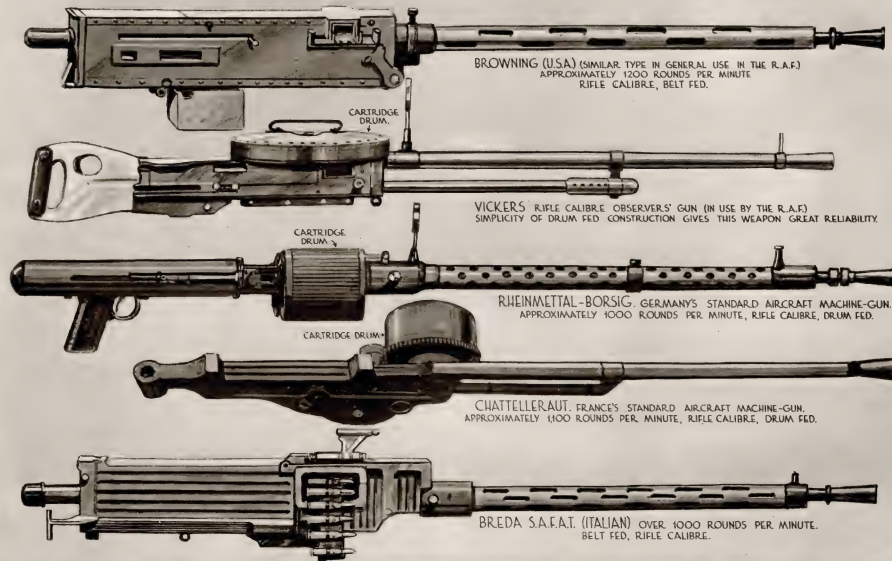
DESCRIPTION: A low-wing monoplane developed from a civil air-liner. Numbers of these machines were used in the Spanish Civil War. *Engines:* Three Alfa-Romeo 780-h.p. radials. *Wing span:* 66 ft. 3 in.; *Length:* 53 ft. 2 in. *Maximum speed:* 264 m.p.h. *Range:* 1615 miles at 223 m.p.h. *Service ceiling:* 22,950 ft. *Armament:* one fixed machine-gun firing forward and two others firing astern.



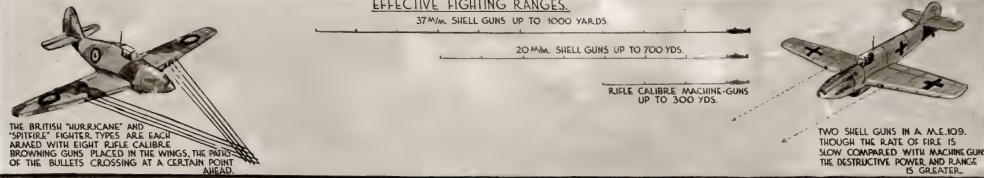
THE FIAT "G. 50": A SINGLE-SEATER ITALIAN FIGHTER, WITH A SPEED OF 298 M.P.H.

DESCRIPTION: A small, low-wing monoplane of somewhat crude design, in which speed has been sacrificed to good visibility. *Engine:* One 840-h.p. Fiat radial. *Wing span:* 35 ft. 2 in.; *Length:* 25 ft. 7 in. *Maximum speed:* 298 m.p.h. Climbs to 19,680 ft. in 7 min. 3 sec. *Absolute ceiling:* 35,400 ft. *Armament:* two heavy machine-guns firing through the airscrew arc; provision for two machine-guns in wings.

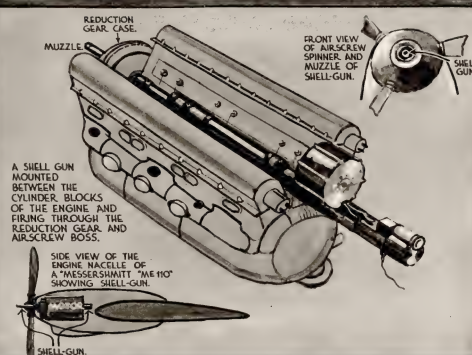
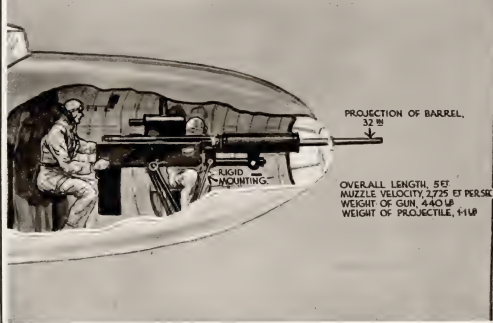
AIRCRAFT MACHINE-GUNS.



EFFECTIVE FIGHTING RANGES.



A LONG BARREL TYPE 37mm. AMERICAN ARMAMENT CORPORATION SHELL-GUN MOUNTED IN THE NOSE OF A MULTI-ENGINE AIRCRAFT.

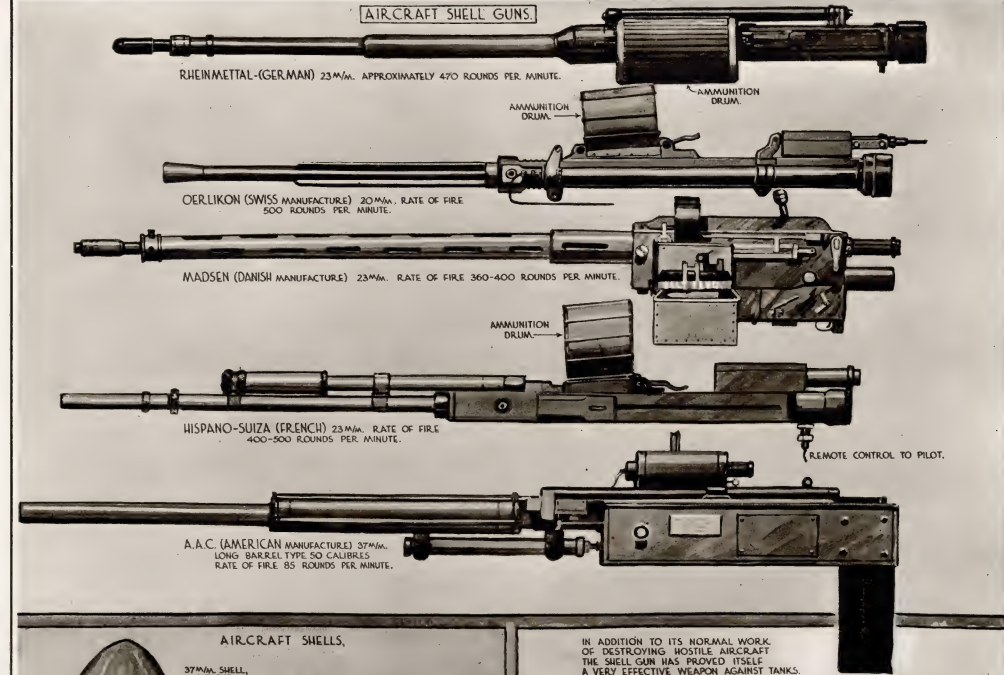


AIRCRAFT MACHINE-GUNS: CLOSE-RANGE WEAPONS WITH A HIGH-SPEED RATE OF FIRE.

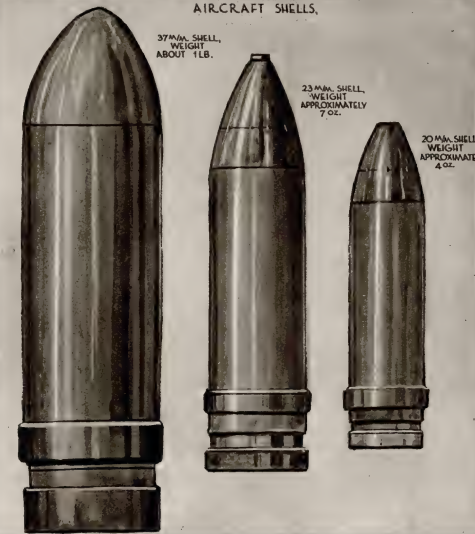
The incessant striving in time of war to evolve offensive weapons capable of dealing with existing defensive measures, and, on the other hand, the anxious search for means of defence against some new weapon, is clearly exemplified in the armament of aeroplanes, and above are illustrated (on the left) various types of aircraft machine-guns capable of firing from one thousand to twelve hundred rifle-calibre bullets per minute. The devastating effect which can be created by fighter craft equipped with a number of such guns when attacking aeroplanes insufficiently armoured, was amply

demonstrated by our "Hurricanes" and "Spitfires" in the summer and autumn of 1940, and the astonishing successes of the R.A.F. against the Luftwaffe set the Germans hard at work improving the armour and armament of their bomber and fighter craft. German defensive measures had lost the first round in the air war to British weapons of offence. It should be remembered, however, that rifle-calibre guns are only effective at short range, also that the advantages of larger calibres (necessitated by increased defensive armour) are obtainable only at the expense of the number of guns

AIRCRAFT SHELL GUNS.



AIRCRAFT SHELLS.



IN ADDITION TO ITS NORMAL WORK OF DESTROYING HOSTILE AIRCRAFT THE SHELL GUN HAS PROVED ITSELF A VERY EFFECTIVE WEAPON AGAINST TANKS.

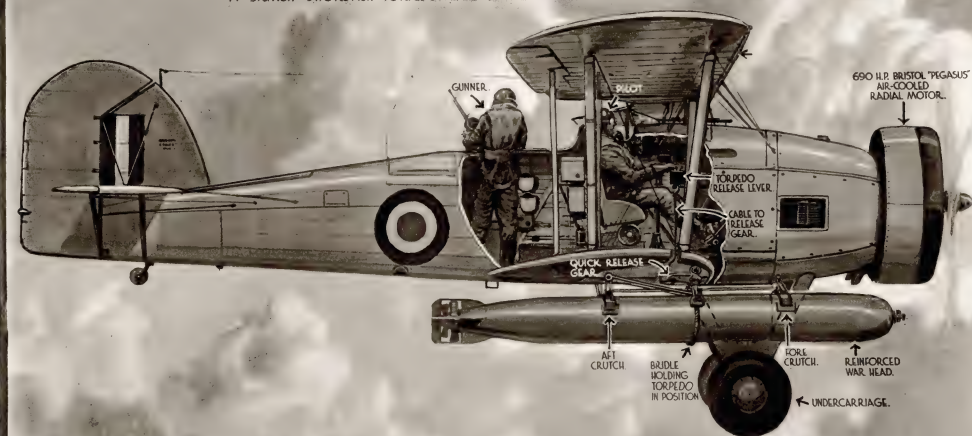


AIRCRAFT SHELL-GUNS: TYPES OF CANNON USED IN AERIAL COMBAT OR AGAINST LAND FORCES.

and ammunition carried. Thus, where it is possible to fit two quick-firing rifle-calibre guns, with 400 rounds of ammunition for each, only one 0.5-in. gun with some 200 rounds, or a 20-mm. shell-firing gun with 50 rounds, can be fitted by way of alternative. On the right are shown various types of light shell-firing guns which may be mounted alone in various types of aircraft, or together with machine-guns. The first official announcement of the use of cannon in a British single-seater fighter was on February 3, when particulars were given of the shooting down of a German "Heinkel 111K"

bomber by a "Spitfire" pilot after a burst of shell-fire lasting two seconds. It is an interesting point that the Nazi Messerschmitt "109's" which suffered so heavily from the attacks of our "Spitfires" and "Hurricanes" during the mass German air attacks in 1940 were equipped with two machine-guns and two cannon, whereas our machines at that time mounted eight machine-guns. The pictures above illustrate various types of machine-guns and shell-guns, and how these are employed in air combat and when attacking mechanised enemy forces on the ground.

A BRITISH "SWORDFISH" TORPEDO-PLANE OF THE FLEET AIR ARM.



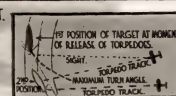
1. GOING DOWN. WHEN ATTACKING, THE TORPEDO-PLANES DIVE STEEPLY IN LINE-ASTERN FORMATION.



2. FLATTENING-OUT AND APPROACHING, THE TORPEDO-PLANES APPROACHING THEIR TARGET LINE-ABREAST FLYING APPROXIMATELY 150 TO 250 FEET ABOVE THE SEA.



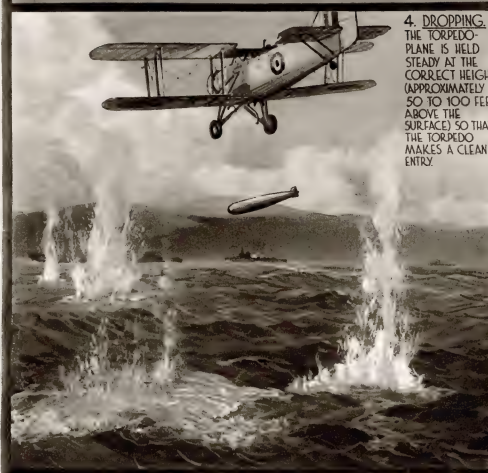
3. SIGHTING ON THE TARGET. THE AIRCRAFT WITH ITS TORPEDO BELOW THE FUSELAGE HAS TO BE SIGHTED ON THE TARGET. THE SIGHTING IS A QUESTION OF ANGLES CARRIED OUT BY THE PILOT. CALCULATIONS ARE MADE OF THE SPEED OF THE TARGET (IF STEAMING), AND THE RANGE AND SPEED OF THE TORPEDO SO THAT THE TORPEDO HITS THE TARGET WHEN SHE IS WELL AHEAD OF THE POSITION AT THE TIME OF SIGHTING. MOREOVER, ALLOWANCES MUST BE MADE FOR ANY RAPID TURNS THAT THE TARGET MAY MAKE.



THE TORPEDO, WHEN RELEASED, MUST STRIKE TOO FLAT, SUBJECTING THE TORPEDO TO GREAT STRAIN.



NOT STRIKE THE SURFACE TOO FLAT OR TOO STEEP. STRIKING TOO STEEP AND DIVING.



4. DROPPING. THE TORPEDO-PLANE IS HELD STEADY AT THE CORRECT HEIGHT (APPROXIMATELY 50 TO 100 FEET ABOVE THE SURFACE) SO THAT THE TORPEDO MAKES A CLEAN ENTRY.

5. ESCAPE. IMMEDIATELY AFTER THE DROP EACH TORPEDO-PLANE MAKES A STEEP CLIMBING TURN AND ESCAPES AT FULL SPEED.



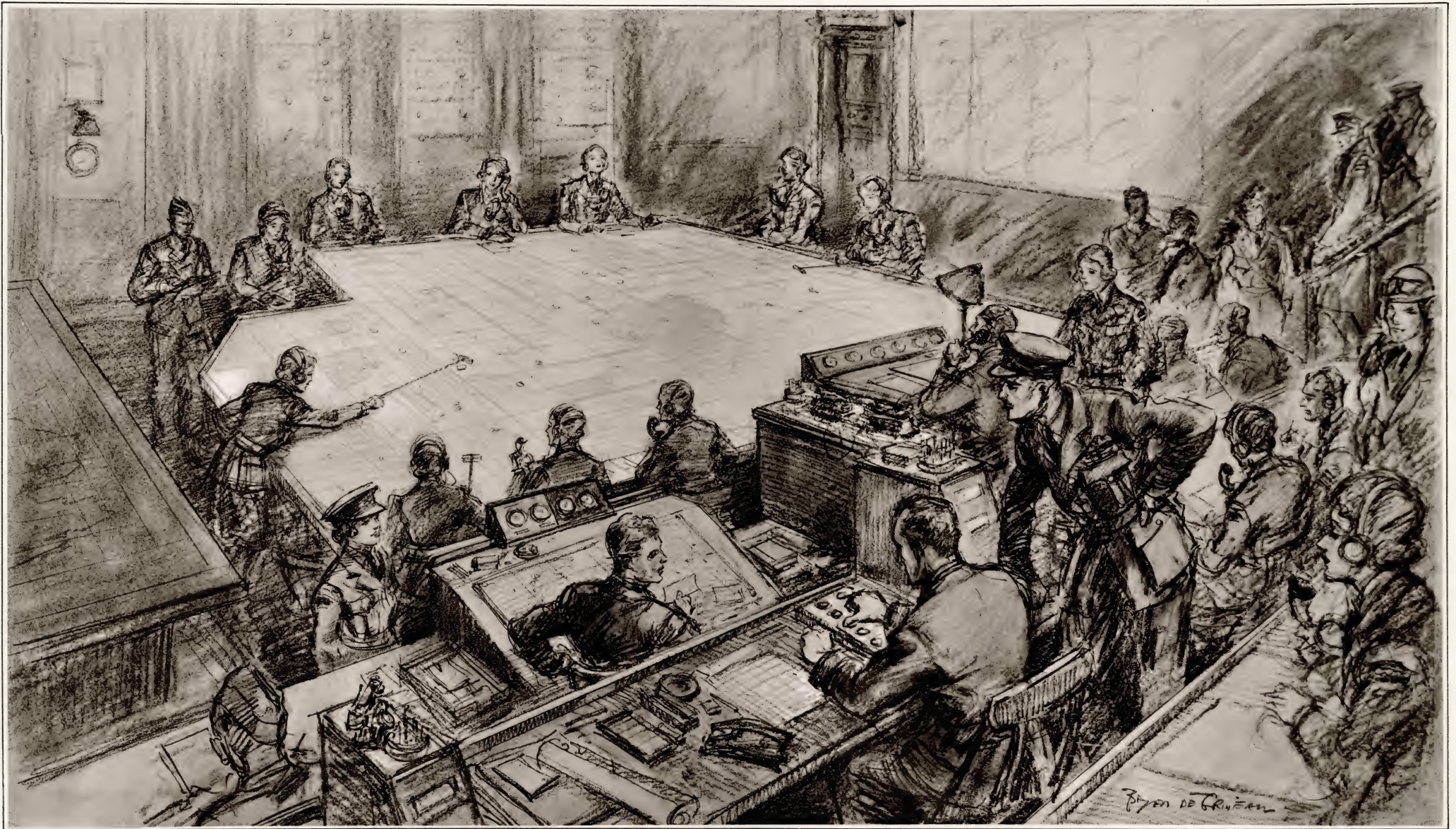
TORPEDOES LAUNCHED FROM THE AIR: THE TECHNIQUE OF ATTACK AS EMPLOYED WITH GREAT SUCCESS BY FAIREY "SWORDFISH" OF THE FLEET AIR ARM.

The history of the torpedo-carrying aircraft goes back to the war of 1914-18, when Short Brothers—builders of the huge present-day "Sunderland" flying-boats—produced the "Two-two-five," a seaplane with a top speed of 70 m.p.h., and in one of which Commander C. H. K. Edmonds torpedoed a Turkish transport in the Sea of Marmora. Other torpedo-carriers of that era were the Short "Shirri" and the Sopwith "Cuckoo," which was the first aeroplane especially designed for torpedo-dropping. The modern prototypes of these early machines

have already demonstrated their striking power, and the crippling blow which they dealt against a number of Italian warships at Taranto in November 1940 will long be remembered. The aerial torpedo is one of the most powerful weapons an aircraft can use, and the usual torpedoes carried to-day by the aeroplanes of the Fleet Air Arm weigh 1500 lb. This form of aerial attack can only be successfully carried out with machines specially designed or adapted for torpedo-dropping, and the technique of attack is highly specialised. The

launching of a torpedo from a craft flying at a high speed must be judged to a fine degree of accuracy, and allowance has to be made for the speed of the target (presuming this to be a ship steaming), the speed of the torpedo itself, which is between forty and forty-five knots, and the range, which may be a thousand yards; add to these considerations the fact that the enemy gunners will be firing not only at the aircraft itself, but also into the intervening space of water, so as to throw up a kind of water barrage, and the difficulties of

successfully launching a torpedo accurately when flying at high speed not more, perhaps, than one hundred feet above the sea will be appreciated. It was Fairey "Swordfish" craft, similar to that illustrated above, which scored such a signal success in the Taranto action, an action which also provided further testimony to the value of the Fleet Air Arm. The "Swordfish," known in the Royal Navy as a torpedo-spotter-reconnaissance aeroplane, has been in service as a landplane in aircraft-carriers, and as a seaplane in ships equipped with catapults.



AN R.A.F. OPERATIONS ROOM, FIGHTER COMMAND, WHERE SQUADRON MOVEMENTS ARE CONTROLLED AND CHECKED BY RADIO-TELEPHONY AND EVERY MOVE RECORDED WITH SYMBOLS ON A "GRID" MAP.

The pulse of Britain's Fighter Patrol system, which watches without a pause every movement of the air war and takes the necessary counter-action to enemy movements against our coasts and convoys at sea, is to be found in the Operations Room of a Royal Air Force Fighter Command. The completeness of the contact with such enemy activities is illustrated in the drawing above of an Operations Room, representing a tense scene of alertness during a time when the enemy are attacking a convoy and steps are being taken minute by minute by means of

radio-telephony. At the rostrum in the centre is seated the Chief Controller, who receives reports direct from the fighter pilots in the air, whereby all information of the actual position is co-ordinated in the room and orders are issued to our airmen to ensure that every pilot and machine is being used to the best advantage and that every tactical opportunity is grasped. Upon the large, squared map, occupying more than half the available space, is recorded every move in the various positions as they occur, the counters representing definite

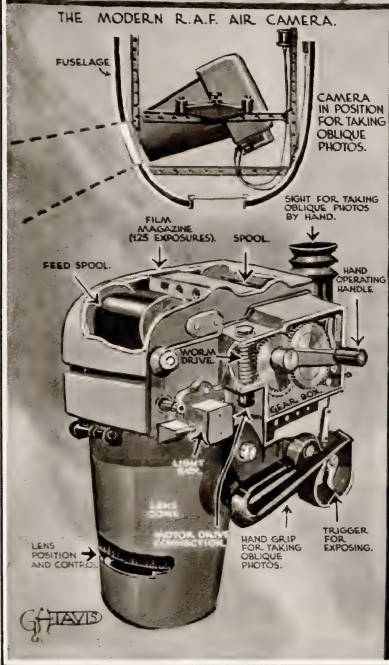
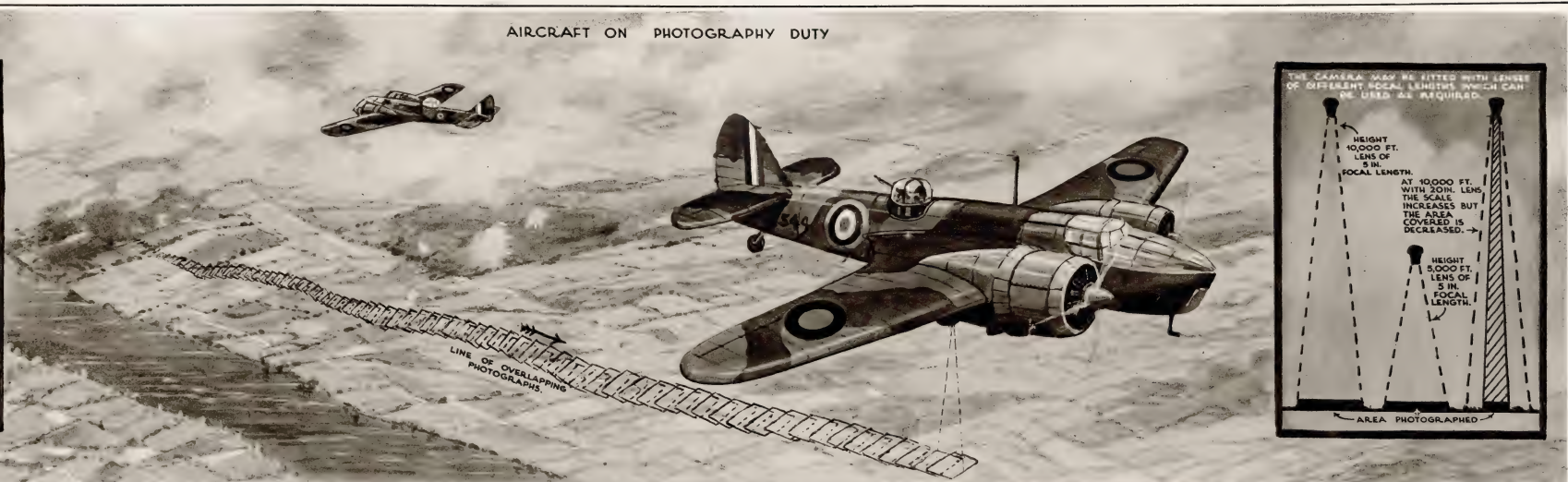
objects, models of ships, and other symbols being placed on the exact spot designated, by women of the W.A.A.F., using the equivalent of croupiers' rakes to place these in position from square to square, thereby giving a clear visual representation of every unit on the board. In the foreground an officer is seen pressing one of many buttons on a panel. He watches a series of lights upon the walls which give the exact location of every machine in the operating unit, and to send new fighters into the air he presses another button and the unit at

once takes off for the scene of encounter. So complete is the liaison between the Operations Room and the fighters that the wireless order of a Squadron Leader can be heard as he takes his aeroplanes into attack. Then it is merely a case of listening in, because headquarters never interfere with the man in command when in actual combat. Much of interest is heard—for instance, that excited soliloquy of a fighter-pilot on the tail of a Heinkel: "I've got him, I've got him! . . . Hell's bells! He's gone all to pieces."

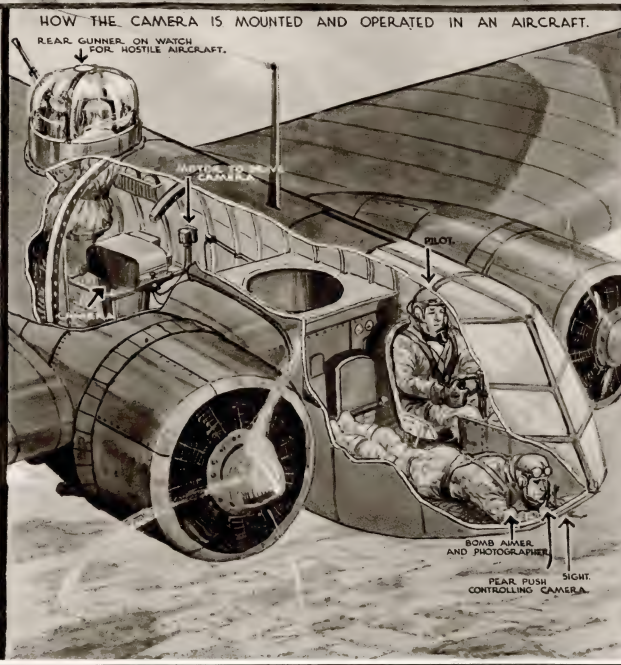
AIRCRAFT ON PHOTOGRAPHY DUTY



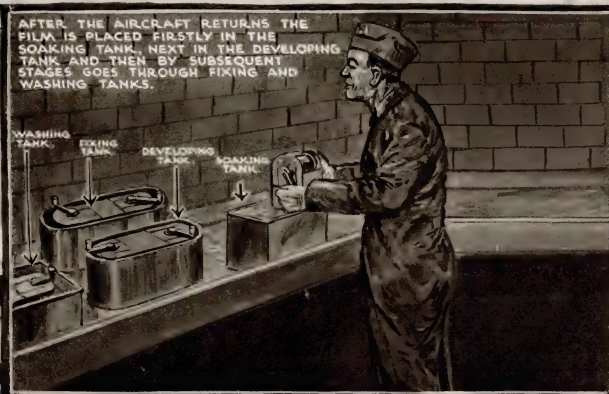
AERIAL PHOTOGRAPHS BEING ARRANGED TO FORM A MOSAIC.



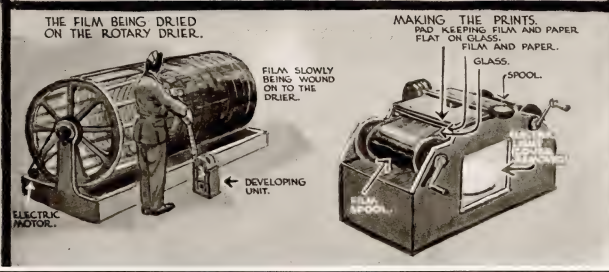
THE MODERN R.A.F. AIR CAMERA.



HOW THE CAMERA IS MOUNTED AND OPERATED IN AN AIRCRAFT.



AFTER THE AIRCRAFT RETURNS THE FILM IS PLACED FIRSTLY IN THE SOAKING TANK, NEXT IN THE DEVELOPING TANK AND THEN BY SUBSEQUENT STAGES GOES THROUGH FIXING AND WASHING TANKS.



THE FILM BEING DRIED ON THE ROTARY DRIER.

MAKING THE PRINTS. PAPER, FILM AND PAPER. FILM AND PAPER.



STEREOSCOPIC AIR PHOTOGRAPHS. TWO PHOTOGRAPHS EACH OVERLAPPING THE OTHER BY ABOUT 60% MAY BE TRIMMED TO PRODUCE A STEREOSCOPIC EFFECT.



A TYPICAL AIR PHOTOGRAPH TAKEN BY THE ROYAL AIR FORCE SHOWING ITALIAN WARSHIPS DAMAGED BY THE FLEET AIR ARMY AT TARANTO.

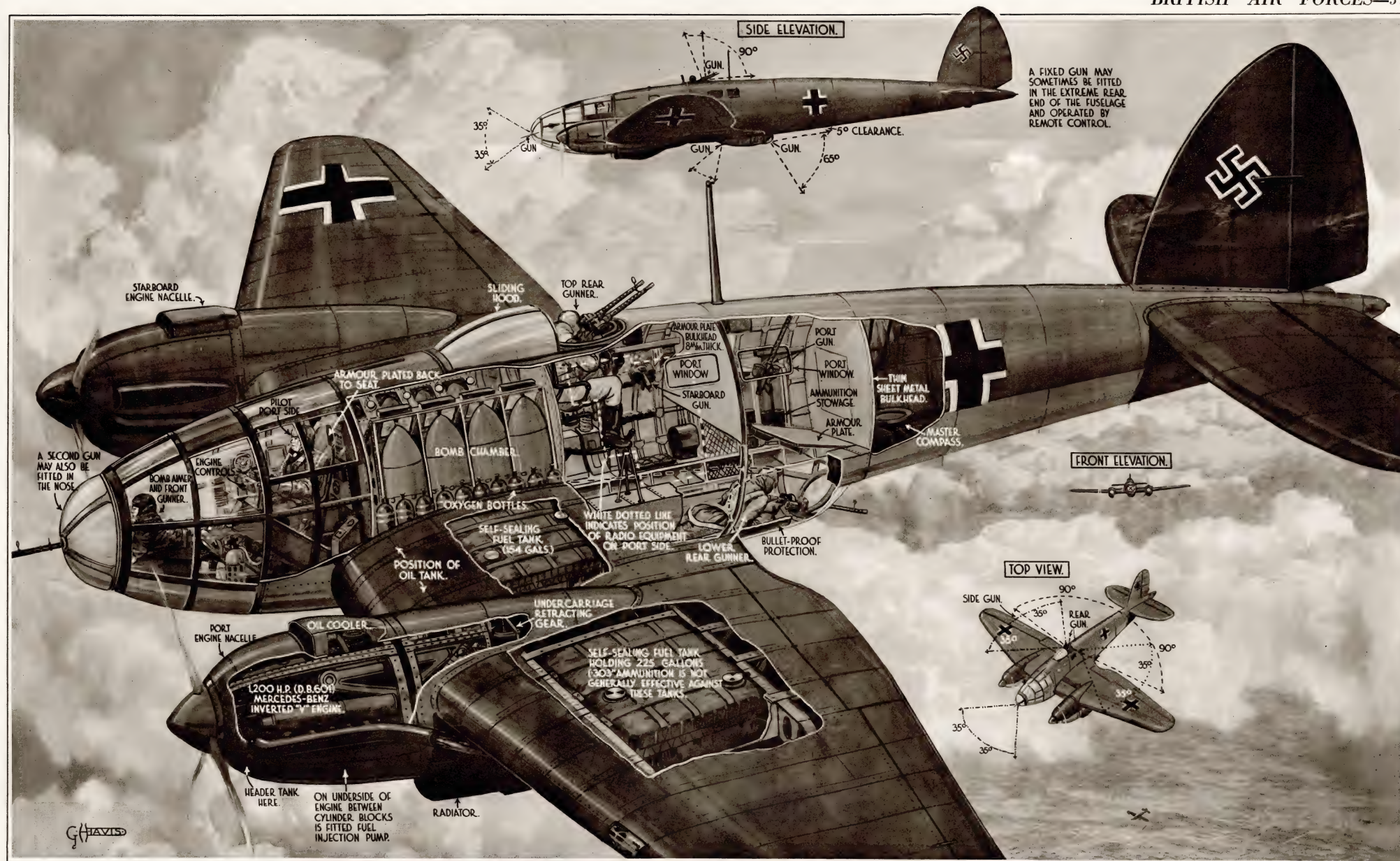
PHOTOGRAPHIC RECONNAISSANCE WORK BY THE BRITISH AIR FORCES: AN EXPLANATION OF THE APPARATUS AND METHODS WHICH PROVIDE VALUABLE INFORMATION IN GREAT DETAIL OF ENEMY SECRETS.

One of the most important tasks of the British Air Forces is that of photographic reconnaissance. Since the beginning of the present war many thousands of valuable photographs have been taken of enemy territory on all fronts. Hostile aerodromes, oil refineries and stores, railways and marshalling yards, docks and ships, and numerous other objectives—all are revealed in full detail with the aid of British camera apparatus, which is the finest in the world. The aerial camera used by the R.A.F. is electrically driven, and 125 consecutive exposures can

be made on each spool of film. The exposure moment for every photograph is arranged to take place automatically every so many seconds, depending upon the height flown by the aeroplane and upon its ground speed. Each photograph overlaps the preceding one by a slight margin. Thus, when prints have been taken from the film, they may be joined together after trimming away the overlap, and a complete picture of the territory covered by the reconnaissance is then available for examination, and as the result of the information gained, the necessary

action may be taken to counteract or to forestall the enemy. Stereoscopic air photographs give information of the greatest value, because they show up natural features, such as hills or valleys, or man-made structures, whether above the ground or dug into its surface. When stereoscopic photographs are needed, the exposure interval is arranged so that each photograph overlaps the preceding one by about two-thirds. When the prints are made, those portions of each pair which are stereoscopic are cut out and mounted side by side and when

examined through stereoscopic apparatus the scene appears in strong relief. The after-treatment of exposed films is dealt with by the ground staff, who use the latest methods for the rapid production of prints. The roll-films are developed and fixed by the tank method. Then they are washed, and wound around a large circular frame, which is rotated by electricity to make the film dry quickly. Prints are made by exposing paper and film through an electric printing-box, and subsequently developing, fixing, washing and drying them.



GERMAN AIRCRAFT—I: **THE HEINKEL "HE. 111K." MK. V.**: A SECTIONAL DRAWING OF THE WELL-KNOWN BOMBER, SHOWING IN DETAIL THE LAY-OUT, CONSTRUCTION AND ARMAMENT OF THE CRAFT.

DESCRIPTION: Low-wing cantilever monoplane. Engines: two Mercedes D.B. 601a 1150 h.p., or two Junkers Jumo 1200 h.p.; controllable-pitch airscrews. Wing span: 73 ft. 10 in.; Length: 57 ft. 5 in. Speed (maximum): 270 m.p.h. Range: 2140 miles. Initial Climb: 840 ft. per minute.

Service ceiling: 22,000 ft. **Armament:** three movable machine-guns situated in the nose (slightly offset to the right), on top of the fuselage, and in a retractable "dust-bin" underneath the fuselage. **Crew:** four. **HISTORY:** Designed from the start as a bomber, the Germans were careful—

as far back as 1936—to let this craft first appear in the guise of a twelve-seater air-liner. For a machine capable of carrying (so it is claimed) a bomb-load of 4,000 lb., the Heinkel has a good turn of speed and has been one of the principal types used for raiding this country. The straight-edged

wings of the Heinkel "111K." now in general use differentiate it from earlier models of the same machine, and the Mk. V. version has now replaced all the old types used by the German squadrons. Heinkels have been one of the key machines on which the *Luftwaffe* has been built up.



THE MESSERSCHMITT "Me 109": A SINGLE-SEATER FIGHTER, WITH ONE ENGINE.

DESCRIPTION: A low-wing cantilever monoplane, with a top speed of 354 m.p.h. *Engine:* one 1150-h.p. Daimler-Benz. *Armament:* two 20-mm. cannon, one in each wing, and two machine-guns mounted on top of the fuselage in front of the pilot. The "Me 109" is far inferior in manoeuvrability to our own fighters.



THE FOCKE-WULF "KURIER": A LONG-RANGE FOUR-ENGINE BOMBER.

DESCRIPTION: A low-wing, four-engine monoplane, with a cruising speed in the neighbourhood of 225 m.p.h. *Engines:* four 1320-h.p. BMW 801. Carries a crew of five or six, a heavy bomb-load, and is armed with cannon and machine-guns. "Kuriers" are flying from Bordeaux to attack our shipping in the Atlantic, but several have crashed in Southern Ireland or been forced down because of damage from the A.A. fire of British ships.



THE JUNKERS "Ju 87B": A TWO-SEATER SINGLE-ENGINE DIVE-BOMBER.

DESCRIPTION: A low-wing cantilever monoplane, with a top speed of 242 m.p.h. *Engine:* one 1200-h.p. Junkers "Jumo." *Armament:* one fixed machine-gun in each wing, and movable gun in aft cockpit. Known as the "Stuka," this craft has been extensively used. Hundreds have been shot down.



THE MESSERSCHMITT "JAGUAR": A TWIN-ENGINE RECONNAISSANCE BOMBER.

DESCRIPTION: A low-wing cantilever monoplane, with a top speed probably about 320 m.p.h. *Engines:* two 1150-h.p. Mercedes-Benz. *Armament:* a movable cannon in nose, four fixed guns under centre section and a movable machine-gun in aft cockpit. The machine is a development of the "Me 110."



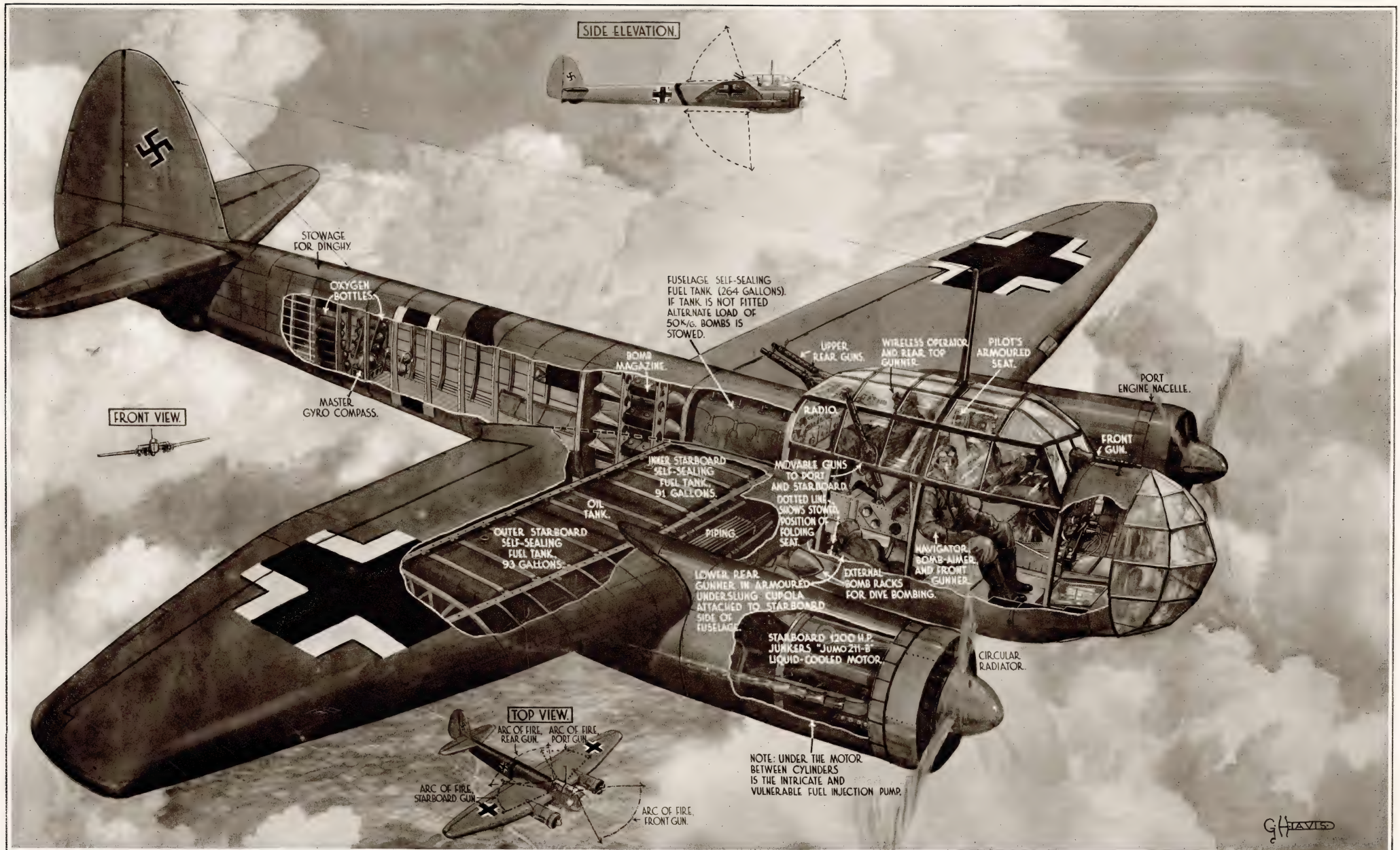
THE MESSERSCHMITT "Me 110": A TWO-SEATER FIGHTER, WITH TWIN ENGINES.

DESCRIPTION: A low-wing cantilever monoplane, with a top speed of 365 m.p.h. *Engines:* two 1150-h.p. Daimler-Benz. *Armament:* two cannon under the nose, four machine-guns on top firing forwards, and movable machine-gun in aft cockpit. One of the few twin-engined machines of its type.



THE DORNIER "Do 17": A TWIN-ENGINE RECONNAISSANCE BOMBER.

DESCRIPTION: A high-wing cantilever monoplane, with a top speed of 298 m.p.h. *Engines:* two 880-h.p. BMW 132. *Armament:* a fixed cannon in nose, machine-gun on top of fuselage and one underneath. Known as the "Flying Pencil" because of the machine's narrow streamlined fuselage. Its bomb-load may be replaced by a battery of cameras. The "Do 17" was used for much long-range reconnaissance work over the Maginot Line.



GERMAN AIRCRAFT—III.: **THE JUNKERS "JU.88K."**: A LONG-RANGE DIVE-BOMBER SHOWN IN DETAIL: INCLUDING CONSTRUCTION, ARMAMENT, GUN AND CREW POSITIONS.

DESCRIPTION: Low-wing cantilever monoplane. Engines: two 1200-h.p. Junkers "Jumo 211a" driving Junkers or VDM three-blade constant-speed airscrews. Wing span: 59 ft.; Length: 46 ft. 6 in. Speed (maximum): 317 m.p.h. Range: 1310 miles at 264 m.p.h. Service ceiling: 29,800 ft.

Armament: six movable machine guns; in nose, on top of fuselage, and to fire aft from "blister" under fuselage, and four on top—two aft and two from side windows. Crew: four. First went into construction in 1939.

HISTORY: Although originally very "hush-hush" and shrouded in

mystery, so many have been shot down over this country by our fighters that few—if any—details concerning this German dive-bomber are not known to our experts. Early in its career the Junkers "88K" proved itself exceedingly fast for a craft of its kind, and it has been stated that orders

were placed by the *Luftwaffe* High Command for the delivery of 4000 by September 1940. Despite the ability of these machines as dive-bombers, and also for normal bombing duties, the Junkers have fared badly in aerial combat with the Royal Air Force.



OFFICERS OF AIR RANK.



OFFICERS BELOW AIR RANK.



AIR OFFICERS (CAP PEAK).



GROUP CAPTAINS (CAP PEAK).



PILOT'S BADGE.



OBSERVER'S BADGE.










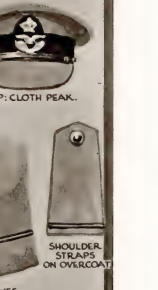


FLEET AIR ARM PILOT'S BADGE.



CHAPLAIN'S CAP BADGE.

BADGES OF RANK AND DISTINCTIVE BADGES FOR OFFICERS.

ADMIRAL OF THE FLEET.		ADMIRAL.	VICE-ADMIRAL.	EQUIVALENT RANKS IN THE ROYAL NAVY.				LIEUTENANT-COMMANDER.	LIEUTENANT.	SUB-LIEUTENANT.	MIDSHIPMAN AND WARRANT OFFICER.
MARSHAL OF THE ROYAL AIR FORCE.		AIR CHIEF MARSHAL.	AIR MARSHAL.	AIR VICE-MARSHAL.	AIR COMMODORE.	GROUP-CAPTAIN.	WING-COMMANDER.	SQUADRON-LEADER.	FLIGHT-LIEUTENANT.	FLYING-OFFICER.	PILOT-OFFICER.
 <p>CAP: "PATENT LEATHER" PEAK WITH GOLD OAK LEAVES.</p> <p>SLEEVES.</p>		 <p>CAP: "PATENT LEATHER" PEAK WITH GOLD OAK LEAVES.</p> <p>SLEEVES.</p>	 <p>CAP: "PATENT LEATHER" PEAK WITH GOLD OAK LEAVES.</p> <p>SLEEVES.</p>	 <p>CAP: "PATENT LEATHER" PEAK WITH GOLD OAK LEAVES.</p> <p>SLEEVES.</p>	 <p>CAP: "PATENT LEATHER" PEAK WITH GOLD OAK LEAVES.</p> <p>SLEEVES.</p>	 <p>CAP: "PATENT LEATHER" PEAK WITH ONE ROW GOLD OAK LEAVES.</p> <p>SLEEVES.</p>	 <p>CAP: CLOTH PEAK.</p> <p>SLEEVES.</p>	 <p>CAP: CLOTH PEAK.</p> <p>SLEEVES.</p>	 <p>CAP: CLOTH PEAK.</p> <p>SLEEVES.</p>	 <p>CAP: CLOTH PEAK.</p> <p>SLEEVES.</p>	 <p>CAP: CLOTH PEAK.</p> <p>SLEEVES.</p>
FIELD-MARSHAL.		GENERAL.	LIEUTENANT-GENERAL.	EQUIVALENT RANKS IN THE ARMY.				MAJOR.	CAPTAIN.	LIEUTENANT.	SECOND LIEUTENANT.
				MAJOR-GENERAL.	BRIGADIER.	COLONEL	LIEUTENANT-COLONEL.				
						REGIMENTAL.					

WARRANT OFFICERS' AND N.C.O.s' BADGES.



FLIGHT-SERGEANT



WARRANT OFFICER.



SERGEANT



CORPORAL



DRUM MAJOR.



GOOD CONDUCT BADGE

DECORATIONS OF THE ROYAL AIR FORCE AND THE AIR FORCES OF THE DOMINIONS.



DISTINGUISHED FLYING CROSS (OBSERVE)



DISTINGUISHED FLYING MEDAL (REVERSE)



LONG SERVICE AND GOOD CONDUCT MEDAL (REVERSE)



AIR FORCE MEDAL (REVERSE)



AIR FORCE CROSS (OBSERVE)

DISTINCTIVE BADGES FOR N.C.O.s' & AIRMEN.



APPRENTICES & BOY ENTRANTS



AIRMEN OF R.A.F. BANDS



PHYSICAL TRAINING INSTRUCTOR.



AIR GUNNER.



LEADING AIRCRAFTMAN



WIRELESS OPERATOR.

INSIGNIA, BADGES OF RANK AND DISTINCTIVE BADGES OF R.A.F. OFFICERS (SHOWING EQUIVALENT NAVY AND ARMY RANK), N.C.O.s AND AIRMEN; ALSO THE DECORATIONS OF THE R.A.F. AND DOMINION AIR FORCES.

At the top of the page are illustrated badges of rank and distinctive badges for officers. The variation in design of the Pilot's wings for those serving with the Fleet Air Arm will be noted. The Observer's badge was discontinued after the last war, but re-introduced in 1937. In the centre of the page are given the insignia of rank of R.A.F.

Officers and (immediately above and below) their equivalent ranks in the Royal Navy and the Army. Below (left) are the badges of Warrant Officers and N.C.O.s; and on the right, the distinctive badges for N.C.O.s and airmen. In the centre are shown the decorations of the R.A.F. and the Air Forces of the Dominions. The Distinguished

Flying Cross is awarded to officers for acts of exceptional valour, courage or devotion to duty while flying in active operations against the enemy, and the Air Force Cross on the same basis, but for acts while flying, though not in active operations against the enemy. The D.F.M. and the A.F.M. may be won by N.C.O.s and airmen for acts equivalent

to those for which officers are awarded the D.F.C. and the A.F.C. respectively. The design on the obverse of the D.F.M. and the A.F.M. is a head of the King. The badges are reproduced from "The R.A.F. Year Book" by permission of Gale and Polden, Ltd., Aldershot. The Fleet Air Arm badge is by Gieves, Ltd.

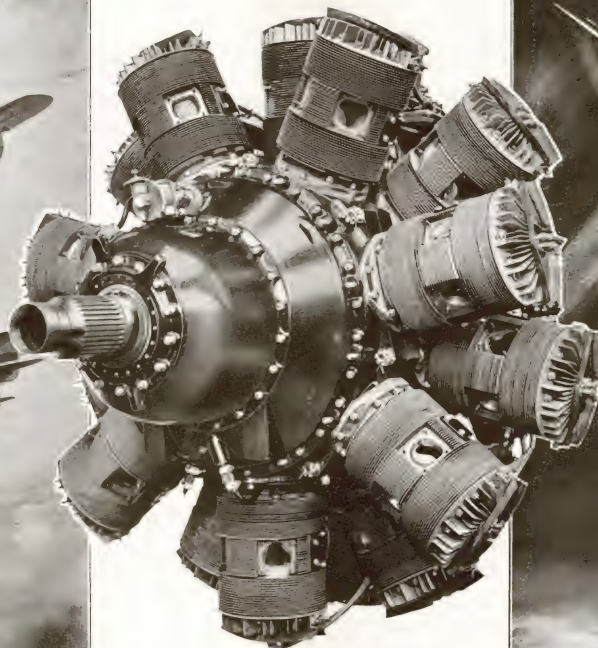


THE UBIQUITOUS BLENHEIM. BRITAIN'S BEST-KNOWN HIGH-SPEED BOMBER ATTACKS AN ENEMY OIL-DISTILLATION PLANT.

THE first all-metal modern monoplane to be produced in large numbers for the Royal Air Force was the "Bristol" Blenheim. Its speed and performance were so high and so far in excess of even the fighters of that time that this remarkable "Bristol" design was selected for quantity production in many British factories, as were the highly supercharged "Bristol" Mercury engines by which it is powered. Originally a high-speed medium bomber, the

"Bristol" Blenheim has been developed as a long-range reconnaissance aircraft, as a formidable twin-engined fighter, and for Army Co-operation duties. It has rendered striking service in all theatres of war, particularly in the Near and Middle East. It is a tribute to the advanced design and conception of the "Bristol" Blenheim that this type carried out not only the first air raid of the war, over Kiel in 1939, but also the first daylight raids recently carried out over enemy territory.

"BRISTOL" aero-engines power a majority of the types of British aircraft for the Royal Air Force. In civil aviation "Bristol" engines are outstanding for reliability under the arduous conditions and extreme variations of temperature and climate on long-distance air services, notably the Transatlantic and Far Eastern air routes; the entire fleet of Empire Flying-Boats being powered by "Bristol" engines. (Below.)



THE "BRISTOL" HERCULES FOURTEEN-CYLINDER 1600-H.P. AERO-ENGINE, A NOTABLE EXAMPLE OF THE WONDERFUL SLEEVE-VALVE DESIGN, WHICH HAS BEEN DESCRIBED AS "THE GREATEST CONTRIBUTION TO THE PROBLEM OF POWER FOR FLIGHT."

The "Bristol" sleeve-valve design has outstanding advantages over all other types for simplicity, production in large quantities, ease of maintenance, economy of fuel, and high-power outputs.

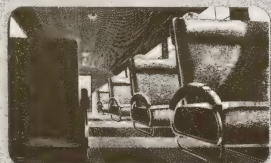
"Bristol" Hercules fourteen-cylinder two-row radial sleeve-valve engines are used to power the new "Stirling" heavy bomber and the "Lerwick" high-speed flying-boat. The Taurus, a smaller but similar engine, powers the "Bristol" Beaufort and the "Albacore." The single-row sleeve-valve Perseus is fitted to the "Skua," the "Roo," the "Lysander" and the "Flamingo." The "Bristol" Mercury and Pegasus single-row poppet-valve types have a long and splendid record of service in many famous aircraft of many types; contemporary R.A.F. machines including the "Bristol" Blenheim, the "Wellington" long-range bomber, the "Hampden" bomber, the "Sunderland" flying-boat, the "Swordfish," the "Gladiator," and the "Bristol" Bombay troop-carrier. When the "Shadow Industry" for the quantity production of aero-engines was inaugurated three years before the war, the Air Ministry selected "Bristol" engines from among all other types for sole manufacture under this vital national scheme.



"BRISTOL" BEAUFORTS OF THE COASTAL COMMAND TORPEDO ENEMY SHIPPING AT CHERBOURG.

MANY enemy raiders over this country have also suffered at the hands of Blenheim fighters, whose high speed and manoeuvrability were essential for success. A modified version of the "Bristol" Blenheim is produced in Canada, where it is known as the "Bolingbroke" and can be fitted with skis or floats. One of the most formidable warplanes now in operation is the "Bristol" Beaufort, which has scored such signal successes lately as a torpedo-carrier

against enemy shipping, both in the North Sea and in harbour; for mine-laying and bombing, and on reconnaissance, protecting our own shipping and convoys. The "Bristol" Beaufort represents a considerable advance in the technique of design and construction, and will carry a heavy load a long distance at a high speed. It is fitted with two "Bristol" Taurus sleeve-valve motors and is also being manufactured in Australia.



THE walls of Britain represent a "fortification" far more impregnable than would-be invaders have ever dreamed. Behind the outer bastions of armed defensive might is the fortification of a freedom-loving people of inherent thoroughness both in their own character, their workmanship and thus their contributions to Industrial progress.

* * *

Nearly 50 years ago a Mr. Reynolds contributed his quota towards strengthening some of the "walls" of Britain — viz., those of metal tubes — and by his patented butting process established a further fortification of tube walls against assaults by "shock tactics" at vital points. From such foundations arose The Reynolds Tube Co. Ltd., pioneering first in Steel Tubes with "fortified" walls and, later, with the same principle applied to tubes in Hiduminium (Aluminium Alloy).

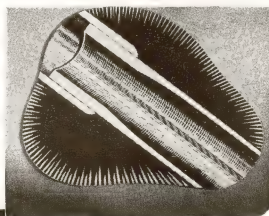
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Naturally, at the present time, such tube-craft is finding its "highest" expression in practically all the overhead "walls" of Britain — after the war it will, as previously, prove the most potent force in lightening and strengthening the tubular construction of all forms of Transport — land, rail, sea or air.

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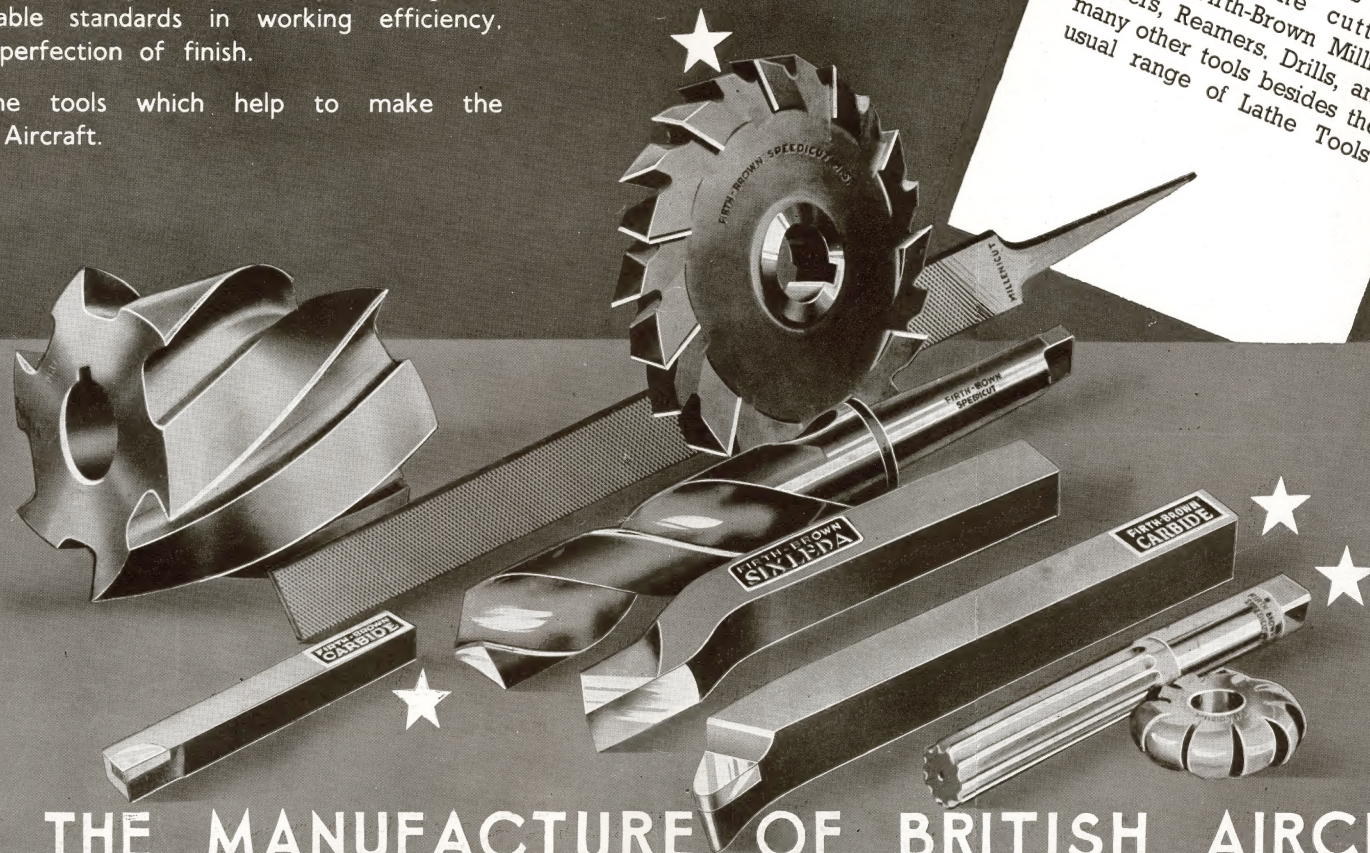
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“British Air Forces”

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